Prehistoric Investigations in the Region of Jenne, Mali

A Study in the Development of Urbanism in the Sahel

Part i : Archaeological and Historical Background and the Excavations at Jenne-jeno

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PREFACE

West Africa remains one of the underexplored domains of archaeology. Lack of controlled excavations and regional research programmes is particularly glaring in the interior regions, including modern Mali, Niger, Upper Volta, and much of Mauritania, which together comprise the greater part of the region known as the Western Sudan. Within this region, some of the most brilliant events in West African history took place: the long-distance exchange networks of the "Golden Trade of the Moors", the waxing and waning of the great empires of Ghana, Mali, and Songhai. Almost nothing is known in detail concerning the material culture or settlement of the Western Sudan during the historical period (from c. A.D. 800 to the present), while ignorance of the prehistory of this region is even more profound. Especially frustrating is the virtually complete lack of archaeological data from the two millennia immediately preceding the earliest historical documentation. It is widely recognized that these "silent millennia" must have witnessed the major changes in subsistence economy, technology, and social organisation that necessarily preceded empire formation. The chronology and circumstances of these changes, which include most notably plant domestication, introduction of iron technology, and the emergence of urbanism, remain almost entirely especulative. In response to this lamentable situation, we undertook a seven-month project of exploratory excavation and regional survey in the Inland Niger Delta of Mali, an area which seemed to us most likely to provide archaeological data relevant to all three issues. The two parts of this monograph focus on reporting and interpreting the results of the 1977 research programme, which included excavations at the site of Jenne-jeno and a regional survey conducted within a 1,100 kilometre-square area to the north and west of the site. Part i deals largely with reporting the results of the exploratory excavations carried out at Jenne-jeno from January to late-April 1977. Its format is bipartite; the first section deals with background material, including historical documentation for Jenne and prior archaeological research in Mali; it is introduced by an essay on the general state of Iron Age archaeology in West Africa. Section II presents all information directly relevant to the excavations at Jenne-jeno. We have tried to differentiate clearly the facts of the excavated material from the interpretation of these materials. A considerable amount of primary data is either included in or appended to the volume so that the reader may assess the extent to which our interpretations about the sequence of events represented in the deposits and the ceramic chronology may be accepted. The computer printouts of pottery data are not included, but they are available should anyone wish to consult them.

Part ii reports the results of a settlement and geomorphological survey in the vicinity of Jenne. The first section presents evidence for regional hierarchies of settlements elsewhere in West Africa. The main body of Part ii reconstructs the geomorphology of the Jenne region and interprets settlement preferences past and present with reference to those geomorphological features. A consideration of the applicability of analytical techniques developed by geographers provides the framework for assessing the quality of these data. The last chapter of Part ii assesses the significance of the excavations and the regional survey for archaeological and historical interpretations of the development of the Western Sudan. Many of the achievements of the excavations, especially the controlled stratigraphic nature of the excavations, an internally consistent series of radiocarbon dates, direct botanical evidence for domesticated rice, evidence of early iron technology, a well-documented pottery sequence, and evidence indicating rapid town growth in the first millennium A.D. are unusual in West African prehistoric research. The survey results supplement the excavation results concerning the early growth of Jenne-jeno and the trade hierarchies to which the town belonged. These results reveal a settlement organization in many ways quite different from that familiar to archaeologists working in analogous floodplain regions.

A final note should be included on the orthography of Jenne. The spelling 'Djenné' was introduced by the French during the colonial period, but Malians today prefer to omit the initial 'D' and to drop the accent aigue over the final letter. Other spellings in this monograph follow the conventions in Levtzion, Ancient Ghana and Mali (1973) and in Ajayi and Crowder, A History of West Africa (1969).

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This monograph could never have been finished without the help, encouragement and patience of numerous people. We are particularly grateful to Dr. Alpha Oumar Konare, now Minister of Culture in Mali, who granted official permission for the research, and who also personally accompanied us to Jenne to help inaugurate the 1977 field season. The assistance of M. Hama Bocoum of Jenne and M. Ali Tamboura of Bamako was also instrumental to the success of the research program. Additionally, the Commandant du Cercle de Jenne lent his support to the project.

In Bamako, Mr. and Mrs. Alan Gilbert generously extended their hospitality and provided a serene environment for badly needed rest and recreation between field trips. U.S. Peace Corps volunteers Karol Stoker, Dan Balzerini, and Kristen Clark spent three weeks in June 1977 coding potsherds, which considerably speeded up the pottery analysis, and assisting with the field survey.

We both owe a special debt of gratitude to our advisors—Professors Brian Fagan, Albert Spaulding, and Merrick Posnansky, and Drs. John Alexander and Barbara Voorhies—for their patience and encouragement. This monograph has benefitted greatly from our conversations with them. Indeed, it was Professor Posnansky who first suggested the Jenne region as a focus for investigations. Dr. John Alexander very kindly lent excavation equipment and to the medical information and prescriptions supplied by the late Dr. Hawtry May must be credited our good health throughout the field season.

Thanks are also extended to those who analysed material from Jenne-jeno and produced specialist reports: Professor J. Harlan (floral); Dr. R. Klein (faunal); Dr. G. Howes (fish); P. Jacobberger (soils and fired clay). Others who helped either in preparation for the field or after our return were: Dr. D. Brokensha, Dr. R. M. A. Bedaux, Dr. P. Farias, Mr. A. T. Grove, Professor J. Huinziga, Dr. B. Riley, Dr. D. Robinson, S. Craig, P. Huston, R. Lopez, and the Museum of Culture History at the University of California, Los Angeles.

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Part i

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SECTION I

THE ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

CHAPTER 1

PROLEGOMENA: THE STATE OF ARCHAEOLOGICAL RESEARCH IN WEST AFRICA, WITH EMPHASIS ON THE SAVANNA AND SAHEL REGIONS IN THE PERIOD c. 1000 B.C. TO A.D. 1500

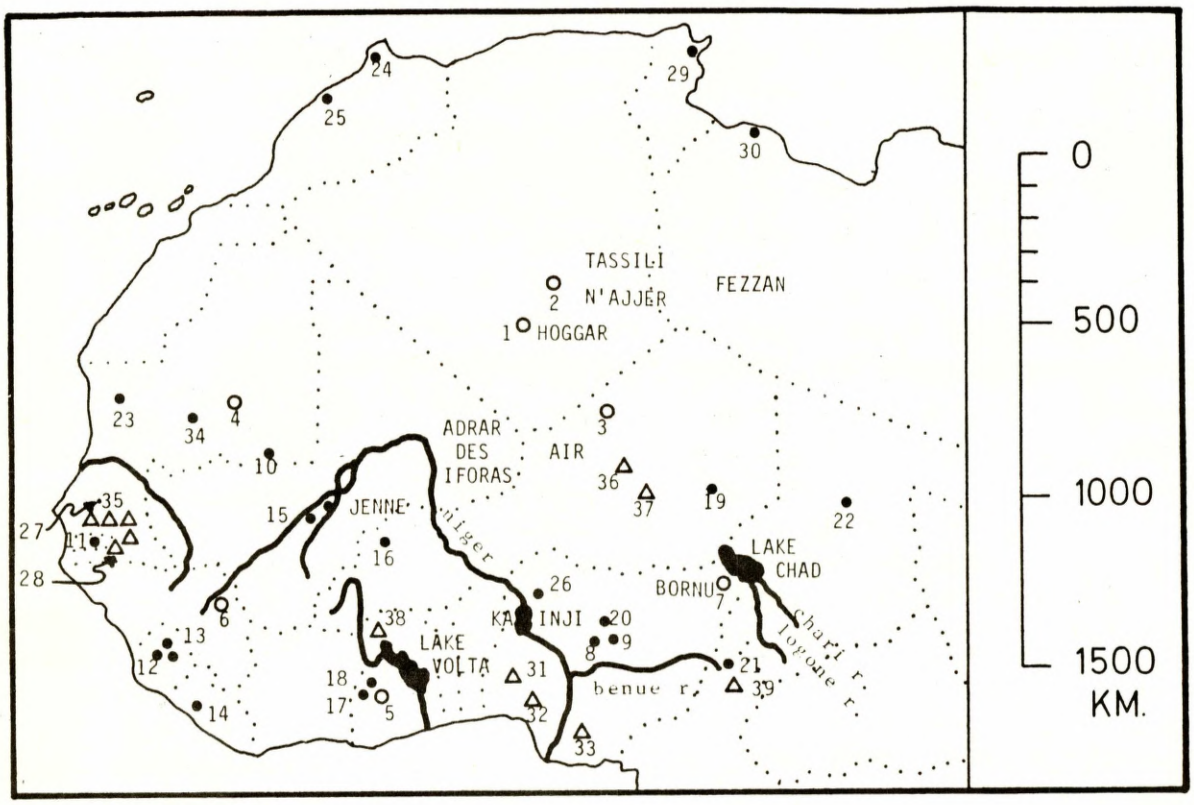
This chapter outlines some of the issues which dominate archaeological research in West Africa today, and identifies several of the categories of archaeological data which have been most frequently recovered and studied. The chronological scope of this and subsequent chapters is generally confined to the period of iron-using cultures, both prehistoric and historic, but since many Iron Age developments find their roots in the Late Stone Age, a categorical boundary between the two is difficult to maintain.

This chapter's geographical scope is limited to the conventional boundaries of West Africa—i.e., that part of the African continent which is bounded on the south and west by the Atlantic Ocean, on the north by the Sahara, and on the east by the eastern frontier of Nigeria. Unfortunately, if the lack of clear-cut geographical barriers or ethnic boundaries to the north and east makes this division seem arbitrary and artificial today, it is even less useful for the study of the past, where archaeological and historical evidence may be found linking desert and savanna as well as the Niger and the Nile. Although most of the evidence considered in this monograph will be drawn from within the conventional area of West Africa, reference will be made to research from the Sahara, or Chad and Cameroon when necessary.

To a large extent, the possibility of long distance movement unhindered by geographical barriers provides the rationale for the discussion which follows. In the absence of sufficient data for an outline of cultural development in West Africa delineating regional spheres of cultural influence, all points are potentially interrelated in space. For this reason, data recovered from excavations in most parts of West Africa has been interpreted with reference to results from other excavations many hundreds, if not thousands, of miles removed. The emphasis here is on general issues and general trends; a detailed treatment of prior research in Mali, focusing specifically on the Inland Niger Delta region, is the subject of Chapter 2.

Food Production

It is one measure of the paucity of archaeological data in West Africa that a discussion of the beginnings of food production is highly relevant to a monograph on Iron Age archaeology. So little direct archaeological evidence for domesticated crops has come to light in West Africa, despite two decades of sustained interest in the problem, that the chronology of food production in the sub-continent remains almost entirely speculative.



MAP 1.1 Sites mentioned in Chapter 1

KEY

- ○ Sites mentioned in Food Production section
- ● Sites mentioned in Use and Origins of Iron section
- △ Sites mentioned in Historical and Survey Sections

1. Meniet
2. Amekni
3. Adrar Bous
4. Tichitt
5. Kintampo-K6
6. Niani
7. Daima
8. Taruga
9. Samun Dukiya
10. Koumbi Saleh
11. Wassu
12. Kamabai
13. Yagala
14. Kepebli
15. Tiebala
16. Rim
17. Begho
18. Amuowi
19. Do-Dimmi
20. Nok
21. Douloumi
22. Koro Toro
23. Akjoujt;chariot art
24. Lixus
25. Mogador
26. Yelwa
27. Sinthiou Bara
28. Kodiam
29. Carthage
30. Leptis Magna
31. Ife
32. Benin
33. Igbo Ukwu
34. Tegdaoust
35. Senegambian megaliths
36. Azelick
37. Marandet
38. New Buipe
39. Be

It was in 1959 that Murdock sowed the seeds of controversy by arguing that the domestication of some twenty-five food and fiber plants, including bulrush millet (Pennisetum typhoideum), sorghum (Sorghum vulgare), fonio (Digitaria exilis), and African rice (Oryza glaberrima), had been initiated independent of external influences in the upper Niger area about 5000 B.C. (Murdock 1959). This was not a new hypothesis: Chevalier had two deacdes earlier presented a similar theory, arguing that, during a wetter period sometime in the past, sorghum, African rice, bulrush millet, Eleusine, Echinocloa, Panicum, cotton, and jujube were all originally domesticated at the edge of the Sahara (Chevalier 1938). In the 1950s, Portères argued strongly for the domestication of African rice in the Inland Niger Delta prior to 1500 B.C. (Portères 1950, 1970). All three authors theorized in a vacuum, without a shred of relevant archaeological or paleobotanical evidence available from the designated "nuclear" areas. A number of serious objections, particularly in response to Murdock's hypothesis, were raised by botanists and archaeologists (Wrigley 1960; Baker 1962; Clark 1962). Munson (1976:188) has accurately pointed out that these counter-arguments all shared one basic weakness with Murdock's position: they were all based primarily on modern botanical distributions and to a lesser extent on ethnographic material rather than on direct archaeological data, which remained virtually non-existent until recent years.

Despite an increasing awareness of the importance of flotation and screening techniques for the recovery of economic information from West African sites, direct archaeological evidence for food production remains distressingly scarce. By direct archaeological evidence is meant "the recovery from datable archaeological contexts of the actual remains of seed, fruit, root, or tree crpps, their pollen, or impressions of them in such material as pottery" (Shaw 1976: 112).[1] The total amount of direct evidence from West Africa and the Western Sahara prior to the second millennium A.D. is presented in Table 1.1 The size of the gap between botanical theory and archaeological reality may be seen by comparing Table 1.1 with Table 1.2, which outlines the crops believed by various authors to have been independently domesticated in West Africa. This comparison reveals that direct evidence for cultigens of putative West African origin is limited to three species (Pennisetum sp., Elaeis guineensis, and Vigna unguiculata) out of a possible 20 or more. In case of Elaeis guineensis and Vigna unguiculata at Kintampo, cultivation was assumed and could not be demonstrated by morphological differences (Flight 1976). Sorghum bicolor (recovered from Daima and Niani) was probably an introduction from East Africa, where it appears to have been domesticated originally (de Wet and Harlan 1971; Harlan and Stemler 1976).

The Tichitt sequence alone in West Africa allows a reasonable and well-documented reconstruction of the process culminating in the domestication of a staple cereal crop. Figure 1.1 illustrates how the use of several wild grasses at Tichett gradually gave way to increasing reliance on Pennisetum, which in the final phases of the thousand-year sequence constituted over 80% of the evidence recovered.

Table 1.1 Direct evidence for plant cultigens in West Africa prior to the second millennium A.D.

Site	Date	Genus, Species
Amekni	6100-4850 B.C.	Pennisetum sp. (2 pollen grains)[2]
Meniet	mid-4th millennium B.C.	cultivated grass (pollen)[3]
Adrar Bous	4000 B.C.	Brachiaria (single pottery impression)[4]
Adrar Bous	2000 B.C.	Sorghum (single pottery impression)[5]
*Tichitt	1000-900 B.C.	Pennisetum sp.[6]
Kintampo (K6)	1400-1250 B.C.	Elaeis guinensis[7]
Kintampo (K6)	1400-1250 B.C.	Vigna unguiculata
*Niani	A.D. 700-900	Sorghum bicolor
*Diama	A.D. 800-900	Sorghum bicolor

* indicates that plant remains were definitely identified as cultigens

TABLE 1.2 Cultigens originating in West Africa according to various authors

Murdock (1959)	Harris (1976)	Baker (1962)	Porteres (1970)	Harlan (1971)	Purseglove (1976)	
•	•	•	•	•	•	ORYZA GLABERRIMA (African rice)
•			•	•	•	PENNISETUM AMERICANUM (bulrush millet)
•	•	•	•	•	•	DIGITARIA EXILIS (fonio)
	•		•	•	•	BRACHIARIA DEFLEXA (Guinea millet)
•	•			•	•	VOANDZEIA SUBTERRANEA (Bambara nut)
•	•	•	•	•	•	KERSTINGIELLA GEOCARPA (Groundnut)
			•		•	POLYGALA BUTYRACEA (Black beniseed)
•	•	•	•	•	•	ELAEIS GUINEENSIS (Oil palm)
•	•	•	•	•	•	BUTYROSPERMUM PARADOXUM (Shea butter tree)
•	•	•	•	•	•	DIOSCOREA CAYENENSIS (Yellow yam)
•	•	•	•	•	•	DIOSCOREA ROTUNDATA (White yam)
	•		•		•	several COFFEE SPP.
•	•	•	•		•	COLA SPP. (Kola)
					•	CEIBA PENTANDRA (Kapok)
					•	PARKIA FILICOIDEA (Locust bean)
•	•	•			•	BLIGHEA SAPIDA (Akee)
	•				•	AFROMOMUM MALIGUETA (Grains of paradise)
					•	RAPHEA SPP. (Raffia)
•				•		VIGNA UNGUICULATA (Cowpea)
•	•			•		SPHENOSTYLIS STENOCARPA (Yampea)
	•			•		DIGITARIA IBURUA (Black fonio)
•	•			•		COLEUS DAZO (Hausa potato)
				•		ABELMOSCHUS ESCULENTIS (Okra)
•			•	•		TELFAIRIA OCCIDENTALIS (a gourd)

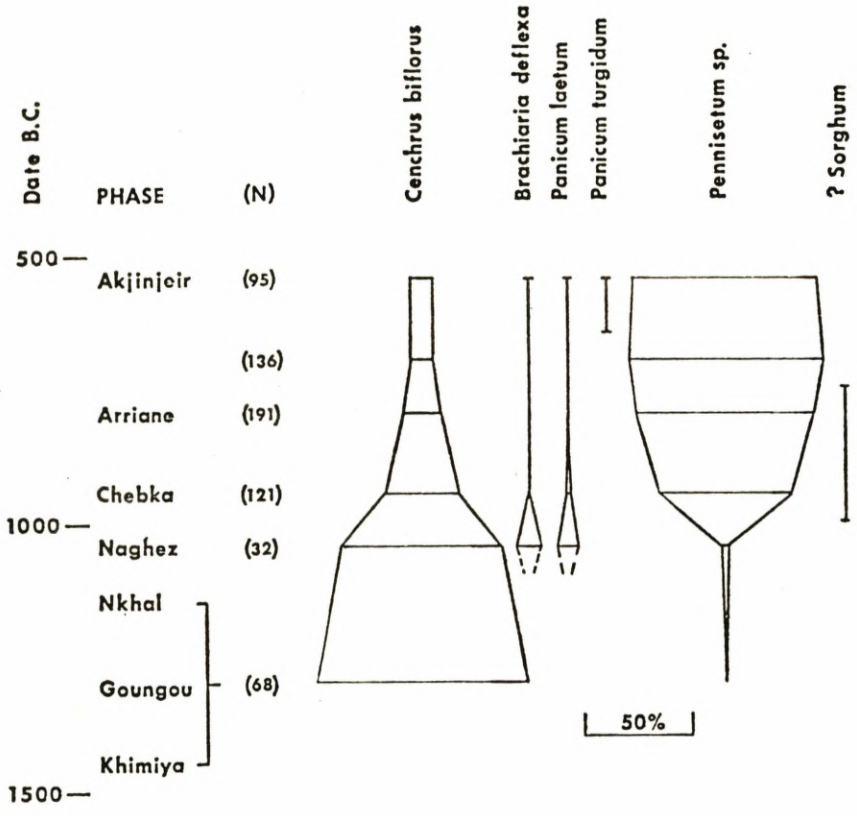


FIGURE 1.1 Percentages of identified grain impressions per phase at Tichitt. (P. Munson, 'Archaeological data on the origins of cultivation in the southwestern Sahara and their implications for West Africa', in The Origins of African Plant Domestication, edited by J.R.Harlan, J.M.J.de Wet, and A.Stemler, 1976:193)

In addition to providing valuable information on the chronology of plant domestication in the southern Sahara, data from the Tichitt excavations have also suggested that the mechanism triggering the domestication process was climatic change, resulting in population pressure. Munson interprets the data as follows:

> ...in the Tichitt area, there were two well-documented episodes of environmental, deterioration. Prior to the first of these, ...the peoples of the Akreijit phase had apparently established an equilibrium at a hunting-fishing-limited collecting level of subsistence. It was only during the period following, beginning around (?) 2000 B.C. with a reduction in rainfall and the resultant near-disappearance of the Tichitt lakes, that a new element of subsistence was added: the people adopted herding of cattle and goats, With a return to moister conditions around 1500 B.C., a new quilibrium was established, ...and the population stabilised at a higher density. By about 1100 B.C., however, the lakes began drying up once again, thus reducing (and eventually eliminating) the fish potential. Hence a new dis-equilibrium resulted, and if the people were to maintain themselves, a new food source had to be substituted for the fish. The solution was the adoption of cultivation of seed plants.
>
> (Munson 1976: 199)

In the absence of documented archaeological sequences from other regions, it is difficult to assess the applicability of the Tichitt model to the rest of West Africa. There is, however, a general agreement among many authors at present that the increasing desiccation of the Sahara which commenced c. 4000 B.P. had a dramatic influence on available resources in the Sahel, where competition for fishing and grazing rights along perennial rivers and shrinking lakes must have increased. Also affected was the savanna, which sustained an influx of pastoral refugees from the north (Clark 1976:96-7; David 1976: 258; Shaw 1977:114). This increased competition for increasingly limited resources (because the forest to the south was not receding as quickly as the desert was expanding) led to intense exploitation and, ultimately, deliberate conservation of favoured food plants.[8] Potentially, this process of domestication could have been carried out at different intensitites, depending on local perception of resource limitations. Future research may reveal areas of West Africa where plant cultivation substantially preceded 1500 B.C., but based on present knowledge and the persuasive evidence available for the critical role of climatic change in the economy of prehistoric West Africa, we are content to echo Munson in stating that: "I do not now find it at all surprising that cultivation proper does not seem to have begun much earlier than 1000 B.C." (Munson 1976:198). As we shall see in the next section, that places the development of food production very close in time to the beginnings of iron use in parts of West Africa, and we may therefore expect that a great deal of data relevant to the question of plant domestication will be forthcoming from early Iron Age contexts.

The Use of Iron in West Africa

The radiocarbon chronology for early iron use in West Africa is extremely incomplete, as a glance at Table 1.3 will show. For a number of years, the

earliest reliable dates for the use and working of iron have continued to come from the area of the 'Nok culture' in central Nigeria. After some initial confusion over very early dates for iron objects recovered from alluvial deposits at the type site (Shaw 1969:226), the iron-smelting site of Taruga and the occupation site of Samun Dukiya have produced a convincing series of dates clustering between the fifth and third centuries b.c. (lower case letters are used to indicate uncalibrated C14 dates).

The lack of early dates from other regions of West Africa in many cases reflects a paucity of research rather than a late acceptance of iron. In a few areas, however, the excavation and subsequent radio carbon dating of stratified sites have revealed sequences which indicate a genuinely late introduction of iron. In Bornu (Northeastern Nigeria, North Cameroon and the Chari Basin of Chad, for example, several sites have been excavated which contained material clearly spanning the transition from Late Stone Age to Iron Age (Wulsin 1932; Connah 1976; David 1976). The dates from Daima (I-2943, I-2371, I-2370) and Douloumi P.1964) combine to indicate that iron was not in use in these areas until the fifth or sixth century A.D. (Posnansky and McIntosh 1976:164). Although a number of earlier dates are available for 'Sao' sites in the Chari-Logone Basin, we will not consider them here, since in no case have the stratigraphic or archaeological contexts from which the samples were recovered been satisfactorily represented.

Excavators in Sierra Leone and Liberia have similarly concluded, on the basis of excavations at several stratified rock shelter sites, that the use of iron was not accepted in those areas before the mid-first millennium A.D. (Atherton 1972; Gabel 1976). Although further work is required to test the reliability of these results, it nevertheless does not seem too early to conclude that iron was accepted into use with varying degrees of alacrity in different parts of West Africa. In the case of Daima, for example, it is difficult to believe that the lateness of iron use was merely due to ignorance of the metal's existence, since Taruga, a major iron smelting site, is located less than five hundred miles away. In view of this type of evidence, it should be clear that the diffusion of iron use in West Africa will not be satisfactorily explained by the use of an 'advancing front' model, although this model is employed on an implicit basis in much of the literature (e.g. Willett 1971: 356). Trigger urges:

> We must reject the simplistic assumption that a study of diffusion merely involves tracing the geographical spread of traits through time. Traits do not exist independently of one another, but are parts of cultural systems. To understand why a trait diffuses, it is necessary to analyse the recipient culture and determine the factors that have led to the trait being accepted (Trigger 1969:27).

It is probable, in our opinion, that future research will reveal two patterns for the acceptance of iron in West Africa: 1. There will be areas, such as that of the 'Nok culture', where early evidence for iron is associated with industrial activity (furnaces, slag, etc.). For these sites, two major prerequisites for the early production of iron would logically be access to a source of high quality ore,[10] and the presence of craft specialization, possibly already manifested in a caste system. 2. At other sites, the earliest iron

Table 1.3: Radiocarbon dates associated with earliest iron use and manufacture in West Africa

SITE (listed by country)	LAB no.	DATE	SOURCE; COMMENT
Mauretania			
Koumbi Saleh	Sa-77	a.d. 1210 ± 120	Fagan 1965
	Dak-156	a.d. 969 ± 114	Calvocoressi and
	Dak-157	a.d. 828 ± 125	David 1979
Guinea			
Niani	Gif-1292	a.d. 750 ± 100	Willett 1971
	KI-293	a.d. 860 ± 65	Willett 1971
Senegal			
Kodiam	Dak-41	a.d. 594 ± 126	
	Dak-54	a.d. 738 ± 125	
Sintio Bara	Dak-155	a.d. 587 ± 120	Diop 1977
	Dak-192	a.d. 1050 ± 120	Diop 1977
Ndalane	Dak-107	a.d. 793 ± 199	Posnansky and McIntosh 1976
Gambia			
Wassu	Dak-2	a.d. 750 ± 110	Mauny 1967b
Sierra Leone			
Kamabai	I-3846	a.d. 340 ± 100	Willett 1971, Neolithic
	I-3558	a.d. 690 ± 95	Willett 1971, iron
	I-3845	a.d. 760 ± 95	Willett 1971, iron
Yagala	I-3404	a.d. 1070 ± 100	Willett 1971, iron first occurs above this level
Liberia			
Kepebli	Gx-3308	a.d. 1085 ± 155	Posnansky and McIntosh 1976
	Gx-2957	a.d. 990 ± 200	Posnansky and McIntosh 1976
Mali			
Tiebala	Gif-383	a.d. 510 ± 120	Fagan 1968
	Gif-384	a.d. 550 ± 120	Fagan 1968
Upper Volta			
Rim III	N-1260	a.d. 440 ± 220	Posnansky and McIntosh 1976
Ghana			
* Hani-Begho	N-2140	a.d. 180 ± 75	Posnansky and McIntosh 1976
Amouwi	N-1801	a.d. 440 ± 70	Posnansky and McIntosh 1976

SITE (listed by country)	LAB no.	DATE	SOURCE, COMMENT
* Abam	Bln-1730	a.d. 320± 30	Calvocoressi and David 1979
Niger			
* Do-Dimmi	Dak-148	a.d. 203±100	Posnansky and McIntosh 1976
	Dak-147	974±120b.c.[9]	Posnansky and McIntosh 1976
	Dak-145	678±120b.c.	Posnansky and McIntosh 1976
In Talaylen	Gif-4170	260± 90b.c.	Calvocoressi and David 1979
	Gif-4171	60± 90b.c.	Calvocoressi and David 1979
Teguef n'Agar	Gif-4172	140± 90b.c.	Calvocoressi and David 1979
Nigeria			
Yelwa	N-361	a.d. 100±115	Shaw 1969
	N-362	a.d. 460±115	Shaw 1969
	N-364	a.d. 200±110	Shaw 1969
	N-363	a.d. 700±105	Shaw 1969
* Taruga	I-2960	440±140b.c.	Shaw 1969
	I-3400	300±100b.c.	Willett 1971
	I-1459	280±120b.c.	Shaw 1969
	BM-532	92±126b.c.	Calvocoressi and David 1979
	BM-533	319±116b.c.	Calvocoressi and David 1979
	BM-534	171±116b.c.	Calvocoressi and David 1979
	BM-938	591± 74b.c.	Calvocoressi and David 1979
	BM-940	538± 84b.c.	Calvocoressi and David 1979
	BM-941	591±104b.c.	Calvocoressi and David 1979
	BM-942	341±133b.c.	Calvocoressi and David 1979
Samun Dukiya	I-4913	210± 95b.c.	Posnansky and McIntosh 1976
Nok	Y-474	a.d. 200± 50	Shaw 1969: terminus ante quem for iron
Daima	I-2943	a.d. 630±190	Shaw 1969
	I-2371	a.d. 450±670	Shaw 1969
	I-2370	a.d. 480±270	Shaw 1969
	I-2369	a.d. 980± 90	Shaw 1969
	I-2368	a.d. 810± 90	Shaw 1969

SITE (listed by country)	LAB no.	DATE	SOURCE, COMMENT
Cameroon			
Douloumi	P-1764	a.d. 538 ± 50	Flight 1973
	P-1763	a.d. 876 ± 47	Flight 1973
Tsanaga II	Gif-2232	a.d. 230 ± 90	Calvocoressi and David 1979, stone workshop with iron present, no other details provided
Chad			
* Koro Toro	Hv-4694	a.d. 380 ± 50	Posnansky and McIntosh 1976
	Hv-3804	10 ± 60 b.c.	Posnansky and McIntosh 1976
	Hv-2751	a.d. 440 ± 75	Posnansky and McIntosh 1976

* indicates dates associated with evidence for iron working; otherwise, dates are associated with iron artifacts only

artifacts are found in contexts lacking any indication of local iron production. In this case, availability of attractive trade items which might be exchanged for finished iron objects, as well as the degree to which iron is perceived to be desirable, may be factors relevant to iron's acceptance.

Origins of Iron in West Africa

The origins of iron-working and use in West Africa have been the subject of continuous speculation for nearly two decades. Three major hypotheses have been set forth: independent invention in West Africa; spread from North Africa; spread from Meroe (Sudan). The chief advocates of the first theory are C. A. and L. M. Diop. Based on the very early dates of the third and second millennia B.C. which had been obtained for iron at the site of Nok, both postulate that iron-working originated in West Africa c. 2500 B.C. and thence spread to Egypt, southwest Asia and Europe (L. M. Diop 1968; C. A. Diop 1976). Most other authorities agree that problems of secondary deposition in the course of alluviation account for the extremely early dates ot Nok, which were all obtained on non-cultural materials. It is generally accepted that only one date from Nok has any relevance to the cultural material in the alluvial gravels; that date (a.d. 200 $\pm$ 50) was obtained on wood from clays which overlie the youngest alluvial deposit, thereby providing a terminus ante quem for the cultural material below (Shaw 1969:226, Shaw 1978:78).

One of the major obstacles to a theory of independent discovery of iron in West Africa has been the apparent lack of any metallurgical tradition preceding the use of iron in the sub-continent. In the two regions of the world where iron was unquestionably discovered independently—southwest Asia and China—the use of iron was subsequent to 2000+ years of copper and bronze production. The recent discovery of copper mines and copper and bronze artifacts at Akjoujt in west Mauritania, firmly dated to the fifth and sixth centuries b.c. (Lambert 1971), has caused at least one author to reconsider the case for autochthonous invention (Davies 1966:471). More recently, copper smelting furnaces near Azelik, Niger have also been dated to this same time period (Calvocoressi and David 1979:9-10).

To us, however, absolutely no case can be made for the discovery of iron-working as a consequence of copper smelting at Akjoujt or Azelik. The production of workable iron from ore is far more complex than obtaining a usable smelt of copper. Indeed, the slagging of iron ores to remove impurities and produce a forgeable bloom would have been a major obstacle to metallurgically unsophisticated copper workers (see Hodges 1964; Forbes 1950).[11] The appearance of the artifacts from Ajkoujt suggests an extremely primitive technology based on one-piece molding and cold-hammering of unalloyed copper. Prior to receiving radiocarbon dates for the Mauretanian sites, these characteristics led Lambert to infer links with the early metal-working cultures of southern Europe (Lambert 1965b:436).

The primitive characteristics of the industry at Akjoujt, combined with the recovery of what is almost certainly a Punic fibula of bronze (cp. Lambert 1971:pl. 5(4) and Cintas 1976:pl. 80(10)) and earrings of unquestionably Punic style[12] make it reasonable to suppose that copper metallurgy was introduced into the western Sahara through contact with (but not the direct tutelage of) the Carthaginians. Excavations at the Carthaginian centres of Lixus and

Mogador on the Atlantic coast of Morocco have demonstrated that the sites were established in the seventh of sixth centuries B.C. (Harden 1962; Moscati 1968:123). We may presume that the location of urban centres in these places indicates some kind of exchange activity inland. The siting of numerous rock art depictions of chariots in the western Sahara has suggested to some the route which linked the coast to the interior (Mauny 1947).

Although the west Mauritanian route must be considered a possibility for the introduction of iron as well as copper, another route by which Phoenician metallurgical knowledge may have diffused southwards is outlined by the distribution of chariot engravings and paintings in the central Sahara. The occurrence of this rock art in the Fezzan, Tassili n-Ajjer, Hoggar and Adrar des Iforas has been well summarized by Huard (1966) and Law (1967). Literary evidence from Herodotus and the north-south distribution of the chariot art combine to support the conclusion that it was possible to cross the Sahara with horses in the fifth century B.C. along the route of the rock art. Law (1967: 182) insists, however, that the regular trans-Saharan traffic inferred by some authors seems inadmissible. In view of the early colonization of the North African coast by iron-using Phoenicians (Carthage was established in the late ninth century B.C., Leptis Magna in the seventh century B.C.), and their propensity for trade, a route of iron diffusion from North Africa via the central Sahara is regarded as highly probable by a number of authors (Mauny 1952b, Shaw 1969; Connah 1969; Willett 1971; Calvocoressi and David 1979:10). Indeed, the accumulating evidence points quite convincingly to Carthaginian inspiration for all metallurgical practices in West Africa.[13]

The Meroitic hypothesis, first popularized by Arkell (1955) in A History of the Sudan to 1821, saw an entire complex of general traits, including divine kingship, brick architecture, and iron working, diffusing west across the sub-Saharan savanna after the fall of Meroe. Shinnie (1967:14) argued against any direct 'civilising' influence from Meroe, but felt that "the idea of Meroe as a source of the knowledge of iron smelting has much to commend it". The presence of large slag heaps at Meroe, the result of iron-smelting on an industrial scale, has persuaded other authors that knowledge of iron metallurgy must have spread west from that source (Davies 1967; Mauny 1967b,; Huard 1966).[14] Despite Trigger's (1969) elegant argument that the archaeological evidence does not point to the establishment of a Meroitic industry before the fourth century B.C., thereby post-dating iron-smelting at Taruga, the Meroitic hypothesis persisted. Tylecote's (1975) recent work on the technological aspects of the smelting furnaces at Taruga and Meroe further compromises this theory, however. After comparing the types of furnaces excavated at these two sites, as well as the radiocarbon dates obtained on charcoal associated with slag in the furnaces, Tylecote concludes:

> The Nok Culture site at Taruga in Nigeria has demonstrated an Early Iron Age tradition of non-slag-tapping furnaces belonging to the last few centuries B.C., and Meroe in the Sudan has shown that most of the iron making there belongs to the first and second centuries A.D., and that this material represents Roman-type slag-tapping furnaces. It is now suggested that the Nigerian iron tradition stems from North Africa, probably Carthage, while Meroitic iron making was influenced by the Roman occupation of Egypt (Tylecote 1975:1).[15]

Historical Archaeology

As we have seen in the preceding two sections of this chapter, the data available for the period emcompassing the transition to food production in the Late Stone Age and the adoption of iron in the Early Iron Age is extremely limited. In many areas of West Africa, almost nothing is known of developments in material culture, economy and technology during the two millennia from c. 1000 B.C. to A.D. 1000. There are some indications of development —the artistic refinement of Ife, the sophiscated bronze metallurgy of Igbo Ukwu, and the 'megalithic phenomenon' in the Senegambia all appeared in the last half of the first millennium A.D. (Willett 1966, 1967, 1969, 1970; Cissé and Thilmans 1968; Shaw 1970, 1975, 1978; Eyo 1974). Yet, on the whole, the reconstruction of the culture history of West Africa during this period has barely commenced. Far more information is available for the second millennium A.D., where interest in the location and reconnaissance of historically documented urban centres and entrepots has been particularly high. Just as Schliemann searched for Troy, so have West African researchers sought to locate the cities from which kings once ruled the great empires of Ghana and Mali and the entrepots which controlled the "golden trade of the Moors". Data recovered from these excavations will have major relevance to the research described later in this dissertation, since Jenne was intimately involved in the gold trade, which itself exerted considerable influence on the rise and fall of the Sudanic Empires.

The major excavations which have been undertaken at historical sites are considered individually below, save those located in the Republic of Mali, which will be examined in Chapter 2. One important historical site, Benin, is omitted from the discussion below since it was not situated along the gold routes and does not, therefore, have a priori relevance to the Jenne excavations. This does not diminish the importance of the excavations at Benin City (Connah 1975).

Koumbi Saleh. This site, consisting of over 800 square metres of stone building foundations and more than twice that area of cemeteries, is widely considered to have been the capital city of the early medieval Empire of Ghana. The rise of this empire cannot yet be dated; we know only that Arab chroniclers writing before A.D. 900 wrote of Ghana as a powerful kingdom involved in gold trading. If place names have remained constant over the past millennium, al-Bakri's information that the name of the country ruled by "the Ghana" (Ghana = king's title) was Awker would suggest that the kingdom was situated in a section of southeast Mauritania which is called Aoukar today (Cuoq 1975: 98). This is precisely the region in which we find Koumbi Saleh, whose stone buildings, tombs, and tumuli match al-Bakri's description of Ghana's capital quite well (Mauny 1951a:465).

The site of Koumbi Saleh has fascinated historians and archaeologists since 1914, when Bonnel de Mezieres first identified it as the medieval capital of Ghana and proceeded to sink twenty-two pits into various aspects of the ruins (Bonnel de Mézières 1920). Mauny reports that none of the material excavated in 1914, nor the site plan, can be located today (Mauny 1961:73). Excavation by a French administrator, Lazartigues, followed in 1939, but the results were never published and the material recovered is lost also.

Archaeological excavation undertaken by Thomassey in 1949 and 1950 concentrated on several stone houses which were clearly visible on the surface of the site (Thomassey and Mauny 1951, 1956). The greater part of the ground floors of five continguous, mutti-storey buildings was exposed in the course of these excavations, allowing full appreciation of Maghrebien influence on the architecture at Koumbi Saleh. The surface upon which the houses had been built was paved with stone slabs and was 3.40 metres below the present ground surface. A pit sunk below the pavement level showed deposits continuing down another 2.50 metres, with no end in sight (Thomassey and Mauny 1956:122). No exploration of the lower occupation levels at Koumbi Saleh has been undertaken, although excavation could undoubtedly provide data relevant to the dating of the early empire of Ghana.

A charcoal sample from the upper levels was radiometrically dated to a.d. 1210 $\pm$ 150 (reported in Fagan 1965), a result which accords well with the historical destruction of much of Ghana's capital by Soundiata, king of Mali, in approximately A.D. 1240 (Mauny 1951a: 472). Two further dates of a.d. 969 $\pm$ 114 and a.d. 828 $\pm$ 125 have recently been reported (Calvocoressi and David 1971: 14) but their provenience is not mentioned. Nothing further is known of the chronology of this site which was clearly occupied over a long period of time. A systematic consideration of the artifacts recovered during Thomassey's excavations has not appeared in print. Koumbi Saleh remains one of the most promising sites for data on early trade in the Western Sudan.

Niani. The Polish team who conducted excavations at the site of Niani in 1965 and 1968 claim to have located the medieval capital of the Empire of Mali (Filopowiak 1966, 1969, 1977; Filopowiak et al. 1968; Niane 1970). Because historical sources (especially Ibn Battuta) are notoriously vague on the precise location of the city, speculation on this issue has been profuse. Identification of Niani with the old capital of Mali was first made by the French administrator, Vidal, who visited the site in 1922 and subsequently sent out a young adjoint named Gaillard to excavate. Although Gaillard found Niani's location suitable for the development of a major urban centre from the point of view of defense, agricultural potential and communication, the failure of his excavations to reveal any inscriptions gave him serious doubts about the identification of Niani with medieval Mali (Gaillard 1923). Stone slabs with Koranic formulas, or inscribed tombs stelae should have been a hallmark of medieval Mali, which was a Muslim city. A number of authors feel strongly that the real capital was located well to the northeast of Niani, either near the fork of the Niger-Sankarani confluence, or even farther downstream between Bamako and Segou (Gaillard 1923:632; Montrat 1958; Hunwick 1973).

The matter was far from being resolved when Filiopowiak et al. commenced excavating at Niani. Despite Filipowiak's arguments to the contrary, there is a lack of substantive evidence for the identification of Niani with medieval Mali. The city of Mali was the centre of a wealthy trade-oriented empire. It was here that Mansa Musa lived, the king of Mali whose free-spending pilgrimage to Mecca in 1324 depressed the value of gold in Cairo for twelve years afterwards (Davidson 1966:83). Where are the indications of former wealth in Niani? After excavating an area of over 700 square metres, Filipowiak has not recovered any items, other than glass beads, imported from the Arab world, any jewelry fashioned in precious metal, or even one

inscribed stele from the grave of a member of the wealthy elite. The house foundations in the "Royal Quarter" (Filipowiak 1977) at Niani are stone circles approximately four metres in diameter. Nothing so far brought to light at Niani suggests the royal capital of gold, silver and silk described by Ibn Battuta, who visited the city in the fourteenth century. Possibly future excavations may fill in these gaps, although most of the visually prominent occupation and cemetery areas have been tested.

The Niani excavation has been published more conscientiously than much of the fieldwork accomplished elsewhere in West Africa. The excavation report contains profile drawings, a site map to scale, a rudimentary description of the pottery retrieved from various excavation levels, and a series of radiocarbon dates which cluster convincingly from the sixth to tenth centuries a.d. As such, Filipowiak's report constitutes one of the better-established sequences for an historical site in francophone West Africa.

Tegdaoust. One of the first Sudanese towns to receive mention by Arab authors was Awdaghust, a desert port-of-trade located along the west Saharan trade route which ran between Southern Morocco and the Adrar region of Mauretania. Awdaghust was apparently better known to the Arabs at an earlier date than the city of Ghana, although both were roughly contemporaneous. A number of Arab chroniclers give reasonably detailed descriptions of the town (recounted in D. Robert 1970a; Robert, Robert and Devisse 1970). The ruins at Tegdaoust cover almost thirty acres and are situated on a sandy bay at the foot of a rocky massif, a geographical setting which matches the Arab descriptions.

Since 1960, Tegdaoust has been the focus of one of the longest excavation programs in West Africa; field research was undertaken for several months of each year between 1960-1972 with the specific goal of illuminating the medieval history of sub-Saharan Western Sudan (S. and D. Robert 1972). Four stratified medieval and pre-medieval occupation levels have been identified, in addition to structures belonging to a recent (post-1600) phase of occupation: a pre-urban level without visible buildings but numerous hearths; the early medieval town with stone houses of mediterranean type organized around a courtyard; the middle medieval town which was built using the walls and foundations of the old town, with a shift in building technology from stone to mud brick; the late medieval town which was apparently entirely rebuilt in stone, with new road courses and house plans different from the middle medieval level. Interestingly, well types changed during the three medieval phases, reflecting an increasing water problem (D. Robert 1970a). Excavation of the cemetery area two kilometres northeast of the residential section revealed four different types of burial, three of them stratified. Unfortunately, the lack of grave goods presents a major obstacle to the chronological correlation of burial practices with the four occupation phases.

A detailed report on the excavations, as well as analyses of the pottery and other artifacts recovered have not yet appeared in print, although both are in preparation (Robert, Robert and Devisse 1970: 2). A series of radiocarbon dates has been obtained for Tegdaoust which clusters between a.d. 800-1300, although occupation continued until the seventeenth century (Diop 1976: 182; Calvocoressi and David 1979: 24-5). This is consistent with our

knowledge of Awdaghust from Arab chronicles. The Roberts are careful to state, however, that a positive identification of Tegdaoust with Awdaghust has not been achieved. The substantial amounts of imported pottery, oil lamps, and glass which were found at Tegdaoust certainly suggest that the site was a flourising town of some wealth, actively involved with trade to the north, from A.D. 800-1300. If Tegdaoust was not Awdaghust, it was presumably very similar to it.

Begho. Located on the savanna-forest margin of western Ghana, the town of Begho is strongly linked in the traditions of the Akan and the Mande with an early Dyula settlement which was the collecting point for the gold of the forest (Oliver and Fagan 1976: 178). Its importance as a trade town was known to the Dutch in the seventeenth century. From Begho (also known as Bi'u, Beeo, Bitu or Nsoko), gold, kola, and other forest products were transported to Jenne, the northern-most entrepot of the savanna trade route.

In 1970, a research project focusing on Begho was initiated with the specific goal of investigating archaeological aspects of the beginnings of long-distance trade between the middle Niger region and Ghana (Posnansky 1973a:1) Excavation took place at Begho during one or two seasons of every year from 1970-1976. Four quarters have been located, each between 500-1000 metres in in length: Brong (indigenous) quarter, Dwinfour (artisans) quarter, Kramo (strangers') quarter, and Nyarko quarter (named after its legendary founder). Excavation has been most extensive in the Brong quarter, where four different occupations could be identified (Posnansky 1972: 3). A series of five radiocarbon dates from this quarter clusters between a.d. 1430 $\pm$ 100 and 1710 $\pm$ 100 (Posnansky 1976: Appendix 3). The Kramo quarter revealed only a single seventeenth century occupation which was poor in imported goods. Dwinfour quarter is apparently aptly named, as nearly five hundred fragments of clay crucibles containing alloyed copper were found throughout the mound associated with wood ash, slag, and furnace walling. Two strata were discerned, the upper containing smoking pipes, imported glass, carnelian beads and a fragment of European earthenware; the lower level had no smoking pipes (Anquandah 1975a). Crossland has produced a detailed analysis of the pottery recovered from the Brong quarter excavations (Crossland 1973); detailed information on the excavations and the material culture of Begho is anticipated.

Azelick and Marandet. Only short notice need be given to these two sites, where excavations led by H. Lhote have never been published in detail. Both sites are situated in the Air region of Niger, and archaeological reconnaissance of both was undertaken by Lhote in 1970 in the hope of definitively locating the copper mine of Takedda visited by Ibn Battuta in 1353. There has been ample room for speculation on the site of the medieval mining town, since four towns bearing the name of Teguidda can be found in Air today. Various researchers have explored the ruins at these different Teguiddas and claimed "their" Teguidda to be the true site of medieval Takedda (see Lhote 1972: 432). Another potential Takedda was found at Azelick where Brouin described a site covered with copper fragments (Brouin 1950). Brouin's hypothesis was supported by the discovery of an ancient mine shaft thirteen kilometres from Azelick (Lombard and Mauny 1954). Lhote, however, reports that intensive survey between 1957-1963 by the Bureau of Mines in the region of Azelick revealed no ancient copper works, nor any copper ores with a copper content

exceeding 1.5% (Lhote 1972: 445). Lhote's excavations at Azelick (thirty test pits) showed no house foundations or slag, which contradicts Ibn Battuta's description of the red stone houses and copper smelting activities of Takedda. A radiocarbon date of 1150 ± 100 a.d. places the Azelick ruins in the early medieval period, but aside from that, Lhote finds the identification of Azelick with Takedda a "figment of Mauny's imagination" (Lhote 1972: 448, S.K.M.'s translation).

Abundant evidence of copper working was discovered at Marandet, however (Mauny 1953). Lhote recovered 40,000 crucibles, as well as pottery slag, moulds, and several clay furnaces (Lhote 1972: 449-51, 470). Surely, Lhote says, this site is the Maranda mentioned by six Arab writers between A.D. 872-1154 which was situated on the trade route from Gao to Egypt. Three radiocarbon dates have been obtained on charcoal from the excavations: a.d. 900 ± 100, 640 ± 100, 550 ± 100 (Posnansky and McIntosh 1976: 183). The latter two are from the lowest "workshop" level and appreciably pre-date Arab influence in West African trade. This is, perhaps, an indication of the indigenous trade system upon which Arab trade was superimposed. If, as the dates suggest, the majority of the smelting activity at Marandet pre-dated Arab familiarity with the town, the silence of Arab chroniclers on the subject of a flourising metal industry at Maranda would be explained.

Spectrographic analysis has shown that the crucibles at Marandet contained copper (Castro 1974). The source and destination of the copper smelted at Marandet are unknown.

Regional Surveys and Established Sequences

The foundation of our understanding of the cultural development of Iron Age West Africa must necessarily consist of stratigraphic excavations of multi-component occupation sites, reliable series of radiocarbon dates from meaningful contexts, and systematic analyses of excavated artifacts. Few archaeological investigations in West Africa have resulted in published reports fulfilling all three data requirements. Part of the problem is that research has tended to be particularistic; excavation has often been undertaken for the purpose of investigating a specific phenomenon, such as tumulus burial, megalithic architecture, or art styles, or a specific, (often historical) site. Since chronological placement of various phenomena and sites has been a major goal of such particularistic research, many radiocarbon dates have been obtained which are not supported by careful reporting of the excavations and detailed descriptions of all the classes of artifacts recovered.

Increasingly, the focus of archaeological research in West Africa is shfting from the particular to the regional, partly in response to an increased need for salvage archaeology in areas threatened by state water projects. The immediate result of this shift to regional survey has been a growing concern with typological analysis and seriation, whereby an artifact sequence described and radiometrically dated at one or more well-excavated sites may be used to interpret other sites within the region, at which only surface collection or limited test excavation may be possible. The most successful example of this approach to a regional survey program is the Volta Basin Research Project (VBRP) in which forty-two sites were excavated between 1963-1968 in the area destined to be flooded by Lake Volta (Calvocoressi

and York 1971; for interim project reports see: Shinnie 1965; York 1965, 1966; Matthewson 1965; Calvocoressi 1969). The key to the regional sequence obtained was the stratified site of New Buipe (York 1973), where three discrete occupation phases, separated by periods of abandonment, were recognized and C14 dated: Phase 1 (Kintampo Neolithic) was dated to 915 ± 290 b.c.; Phase 2 (Iron Age) was deposited about a millennium later, as indicated by dates of a.d. 780 ± 100 and 790 ± 100; five dates for Phase 3 cluster between a.d. 1445 ± 100 and 1640 ± 90. Other more continuous and satisfactory radiocarbon date series exist in West Africa, such as that from Bornu, discussed below. In the New Buipe excavation report, York acknowledges the source of his model and his goals for ceramic analysis:

> An example of what this kind of analysis can achieve if given full rein is the work of Phillips, Ford and Griffin (1951) in the lower Mississippi Valley between 1940 and 1947. By seriating the surface collections of pottery from 381 sites and stratified collections at eight key points, they were able to construct a relative chronology within which every one of these sites, scattered over 200 miles of the lower Mississippi Valley, has its place (York 1973: 95).

Seven major "wares", which are pottery types defined by the presence of three of four distinct attributes, have been identified at New Buipe. The utility of these wares lies in their restricted temporal duration, bracketed by the dates from New Buipe, and in the geographical distribution of the wares on other sites in the Gonja region (York 1970; Matthewson and Flight 1972; Mathewson 1974). Several "potential wares" which can be consistently defined by two or more attributes, but which have not been described at other sites in the region were also recognized at New Buipe. The results of the VBRP present a good example of how systematic ceramic analysis, with an emphasis on seriation, can provide a preliminary framework for the later prehistoric chronology of an entire region.

Another important regional archaeological program focused on the area scheduled to be flooded by the new Kainji reservoir in northwestern Nigeria. Last minute funding imposed severe time restrictions on the amount and type of excavation and surface collection which could be accomplished (Breternitz 1975: 149). In the one excavation season available, expeditions from the University of Colorado and the University of Ibadan sampled eighteen different sites (Breternitz 1968; Hartle 1970). The major results so far presented from the Ibadan efforts are two complementary groups of radiocarbon dates from the sites of Baha Mound (four dates clustering between a.d. 870 ± 125 and 940 ± 115, and one date of 130 ± 105 b.c.—Hartle 1970) and Yelwa (four dates ranging between a.d. 100-700 - Priddy 1970). Clearly, these two sites could provide the foundation for an Early Iron Age sequence for northern Nigiera along the Niger.

The final report of the Coloradio expedition has already appeared (Breternitz 1975). A major emphasis was on the analysis of the pottery recovered from six (out of twenty-seven) samples excavated at three different sites. Profiles are presented for each of the six excavation units; relative percentages of five pottery "types" are plotted according to their frequency of occurrence within each uniform (20 centimetres) excavation level. The five recognized types appear to be arbitrary and inadequately defined. No

In a number of cases, remoteness of site location operated hand in hand with restricted methods and goals to further limit the amount and kind of archaeological data obtained in the course of investigation. For example, many of the Sudanic cities described in the medieval chronicles were located in the desert. The excavation of urban sites poses formidable problems under optimal conditions, but the logistics of a desert operation militated against all but the most cursory of surveys at these sites. Foot reconnaissance and the odd sondage sufficed at the Saharan centres of Teghaza, Es-Souk, Gao and Timbuktu.

Teghaza, as the principal source of Saharan salt during the Middle Ages, and Timbuktu, the largest medieval salt market in West Africa, are potentially of great importance for a comparative study of pottery types and luxury goods which were passed along the Saharan trade routes and marketed at the major entrepots, including Jenne. Unfortunately, the only archaeological descriptions available for these two sites focus almost exclusively on architectural features, including city plan and mosques, and on cemetery location (Monod 1938: 289-296; Monod 1940: 249-50; Mauny 1952b;899-918). The urban site of Teghaza is composed of three major parts: a large salt pan and two tells. The stone buildings visible on the larger of the two tells have prompted an estimate of maximum population on that tell of between 1,200-1,800 (Mauny 1961: 116-7; 474-6; 485-7). On several occasions, archaeological attemps have been made to trace the stone walls at Teghaza down to their foundations; in 1938, Bessac stopped at a depth of five metres without reaching foundations (Monod 1938, 1940; Bessac 1951; Mauny 1961: 116).

No documented excavation has been attempted at Timbuktu; although major features, such as the three ancient mosques—the Djinguereber, the Sankore, and Sidi Yahya—have been mapped (Mauny 1952b). Remains of the Modougon (or Mandé) palace, the Moroccan quarter and the city walls need to be recorded by proper archaeological survey. The only artifact descriptions that exist for either Teghaza or Timbuktu concern the painted pottery sherds (presumably from Fes) found at Teghaza (Terrasse 1938), and the numerous meules dormantes noted in Timbuktu (Poussibet 1969, Lhote 1970).

Es-Souk, the presumed site of Tademekka, early capital of the southern Tuareg (Mauny 1961: 117-8; but cp. Lhote 1951: 65-9), and Gao have not fared much better archaeologically, although interest in them has remained undiminished. Again, description has been largely limited to architecture (Mauny 1951b; Mauny 1961: 117), although several pits were sunk at Es-Souk. The results of these excavations remain unpublished. Small-scale excavations at Gao located the mirhab of a mosque, possibly that built in 1324 by the illustrious king of Mali, Mansa Musa, and several inscribed tomb stelae (Mauny 1951b). These Andalusian-style funerary stelae have been dated by epigraphers to the early 12th-13th centuries; all record royal graves at the royal cemetery of Gao-Sané (Chambon 1941; Sauvaget 1950; Vire 1958; Farias 1974a). More recent research has continued to focus on the Sané muslim cemetery (Flight 1972, 1974, 1975b, 1978a), where surface features have been mapped and more stelae located. Systematic investigation of the nearby medieval occupation mound at Gao remains to be undertaken; certainly, this habitation

area merits the further investigation that Flight intends, as the city of Gao has the longest recorded history of any place name in West Africa (Flight 1975b: 81). Most authorities agree that the Kawkaw of early Arab authors (e.g. al-Ya'Kubi, c. 872 A.D.) was none other than Gao, which was, at the time of Arab expansion, already "le plus grand royaume du Soudan" (Mauny 1948: 6). It is highly likely that future archaeological data from Gao, whose influence throughout history was oriented along the East-West axis of the sahel-Sudanic savanna belt and the Niger River, will have great relevance for the interpretation of archaeological data from Jenne-jeno.

Despite the popularity of medieval cities as foci for limited archaeological research, very little excavation had been undertaken at or near Jenne prior to the fieldwork described in this monograph. In 1938, Vieillard sunk test pits (of unknown size, number, and location) into Jenne-jeno "sans autre résultat que la trouvaille de quelques perles de pierre, de fragments de pendentifs anciens, de fragments de fer impossible à identifier" (unpub. document reported in Mauny 1961: 102). Possibly, Vieillard's failutre to find anything more substantial at Jenne-jeno discouraged further excavations at the site until 1977. The only other direct investigation of the Jenne area was carried out by Monod and Mauny during their long tenures at the Institute Francais d'Afrique Noire. Their brief visits to Jenne resulted in unpublished surface collections of uncertain provenience and without context, which are now housed in the IFAN museum in Dakar.

Other chance surface discoveries near Jenne include a number of well-known terracotta statuettes in a wide-eyed, prognathic style (Veillard 1940; Monod 1943) whose geographical distribution also embraces Mopti (Mauny 1949; Masson-Detourbet 1953; Szumowski 1955; Ligers 1957; Haselberger 1966; Malzy 1967; Evrard 1977). These statuettes have claimed a great number of pages in print, and an important new work presents a major morphological and stylistic analysis (Evrard 1977). It must be pointed out, however, that prior to 1977 no terracotta statuette had been found in a datable, secure archaeological context. Speculation has ranged from what their deposition context might have been—e.g., on top of funerary urns (Mauny 1949; Ligers 1957), inside urns (Szumowski 1955; Barth n.d.), inside houses (Desplagnes 1907: 47; Barlet 1949; Haselberger 1966)—to the significance of the portrayal of personal traits, such as representation of the body at burial (Malzy 1967: 18; Sarr 1972: 6), artificial elongation of the head (Ligers 1957), or tribal scarification (Monod 1943; Ligers 1957). Ideas on the cultural context of the statuettes have included ancestor representation (Ligers 1957) and a cult of serpents or smiths (Masson-Detourbet 1953; Ligers 1961; Sarr 1972).

In addition to early Sudanic cities, funerary sites have been preferentially selected for archaeological investigation in Mali. This is scarcely surprising. Knowledge of prehistoric burial practices has usually preceded the investigation of other, more prosaic aspects of culture history. This is explained by the visually prominent nature of many funerary sites, such as megaliths and tumuli, as well as by the tendency for earlier peoples to "take it with them" in the form of grave goods. It is no coincidence that archaeological nomenclature for the sophisticated bronze- and iron-using cultures of Europe remains based

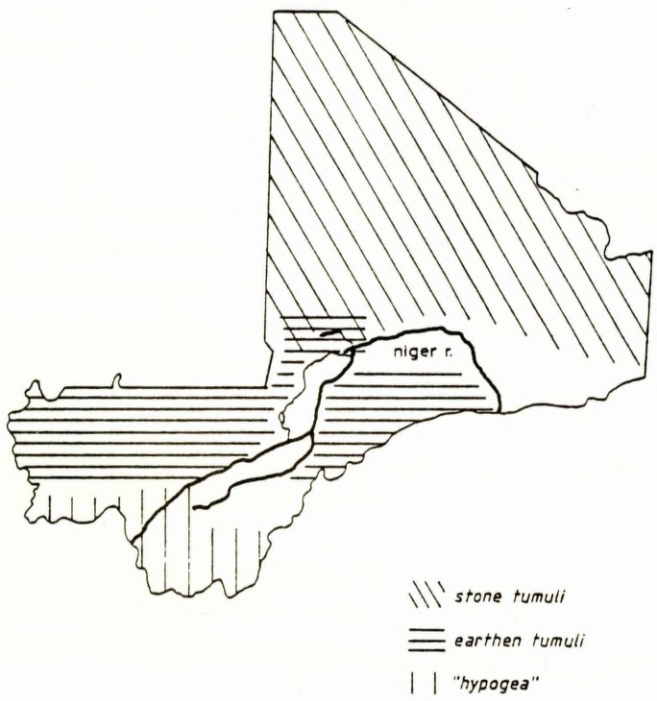
based on normative types of burial practices (e.g., Tumulus, Urnfield), as well as on artifacts recovered last century from cemeteries like Hallstatt and La Tène. Not unlike nineteenth century European excavators, archaeologists in the Western Sudan have tended to favour highly visible and materially rewarding funerary monuments for investigation. Frequently, these funerary monuments have been tumuli of various kinds.

At present, three major zones of tumuli can be identified in Mali. As Map 2.1 indicates, these three zones encircle the Inland Niger Delta, but tumuli are rarely found within the alluvial zone itself. This is an interesting pattern to which we shall return later.

The tumuli which dot the Sahara by the thousands are virtually always made of stone. They vary in shape from round or oval heaps of small boulders called basinas, to flat-topped cylinders of carefully fitted stone known as chouchets (Reygasse 1950; Mauny 1961). Deep burial in the sand, topped by a stone cairn, was necessary in the desert to prevent corpses from being scavenged by hyenas (Mauny 1971; 77). Aside from the protective function of the cairn, the size of the tumulus appears to signal the social status of the deceased. Mounds erected over chiefs' graves, for instance, may be up to fifty metres in circumference and four metres in height (Mauny 1971: 77). The majority of the Saharan monuments date from the first millennium B.C. to the end of the first millennium A.D., although modified tumuli, oriented East-West with stones erected at the head and feet in accordance with Muslim tradition, indicate that the custom did not disappear with the advent of Islam (Reygasse 1950: 71).

South of the rocky desert regions, stone tumuli are replaced by earthen mounds. Interestingly, the lake area to the south of Timbuktu, where the Sahara proper terminates, has a high density of earthen tumuli with outer layers fired to rock hardness by many small fires dug into the mound surface. This is precisely the area, between the sixteenth and seventeenth parallels of latitude, that would have been called in more ingenuous archaeological times a classic Saharan-Sahel transition zone. Not surprisingly, Saharan features such as stone basinas have been located at the base of at least one earthen tumulus in the lake region (Kouga), and ostrich egg beads have been recovered from another (Goubo). Even today, desert influences passed on by the mobile Tuareg remain very much in evidence south of Timbuktu.

The large tumuli also functionas status indicators in a manner similar to the Saharan cairns, if we can believe al-Bakri, who described in A.D. 1067 the building of such a tumulus in ancient Ghana. Al-Bakri recounts how, upon a king's death, his subjects built a domed wooden shelter and placed the corpse on a bed beneath the dome, with ornaments, food, dishes, and weapons laid to the side. They then covered the funerary chamber with mats, entombing alive a number of the palace servants, and proceeded to throw earth on it until it resembled a hill. Such a sequence of events quite closely resembles the burial rites which apparently took place at the tumulus of Koi-Gourey (Desplagnes 1903 - see Table 2.2 for description). Al-Bakri's report indicates that tumulus burial was still in use just prior to the introduction of Islam, an inference supported by a radiocarbon date of 1000 $\pm$ 150 a.d. (uncorrected) for Kouga tumulus, but how far back in time the practice extends in quite unknown.



MAP 2.1 Distribution of tumuli in Mali

TABLE 2.2 Tumulus burials excavated from sub-Saharan Mali for which descriptive details are available

Tumulus	Excavator and Publication Date	Ht.x base diam.	Description
Earthern tumuli in the Lake region			
Koi-Gourey (Killi)	Desplagnes 1903 Lebeuf and Paques 1970	15-18m x c.35m	Fired clay surface, 2 skeletons with weapons, 25-30 skeletons to the side, iron jewelry, stone and glass beads, copper and terracotta figurines.
El-Oualedji	Desplagnes 1951 Lebeuf and Paques 1970	12m x 65m	Wooden funerary chamber, 2 skeletons with copper and iron bracelets, weapons and stone beads.
Goubo	Clerisse (see Mauny 1961:101)	?	Wooden funerary chamber, skeletal remains, metal rings, glass, stone and ostrich shell beads, weapons
Kouga	Mauny 1961	12m x 90m	Basinas at base of mound. Fired clay surface. C14 date - 1000±150a.d. Funerary chamber not found.
Hypogea			
Tienra	Aris 1950	1m x 4m	Skeletal material divided into skulls, leg bones and arm bones. Iron bracelets and rings.
Dogo	Liesegang 1975	?	Several interments. C14 date of a.d.1420±100

TABLE 2.2. (continued)

Tumulus	Excavator and Publication Date	Ht.x base diam.	Description
+ Urn burial			
Sevara-Lodé	Szumowski 1957a	1m x 4m	Grouped pots with ash, charcoal, burned human and animal bone. No grave goods.
Péhé	Szumowski 1957a	1m x ?	Very small mound on larger village site. Several small urns with human bone, charcoal, cereal offerings, 2 iron points and 1 bracelet.
Kélébéré	Szumowski 1956a	0.8m x 8m	Large barakalé urn 80 cm. high containing burned human bone, and millingstones.
Bango	Szumowski 1957a	0.5m x 8m	Burial urns with burned human bone. Groups of small pots containing cereal offerings, domestic objects, iron, silver and copper jewelry, clay pipes.
Fetokolé	Szumowski 1957a	1m x 4m	Several pots, all containing ash, charcoal, burned animal and human bone. No grave goods.
Togou	Szumowski 1957a	1m x 3m	Several groups of 4-6 pots each, containing spindlewhorls, iron and silver jewelry, domestic objects and cereal offerings. Central funerary urn with burned human bone.

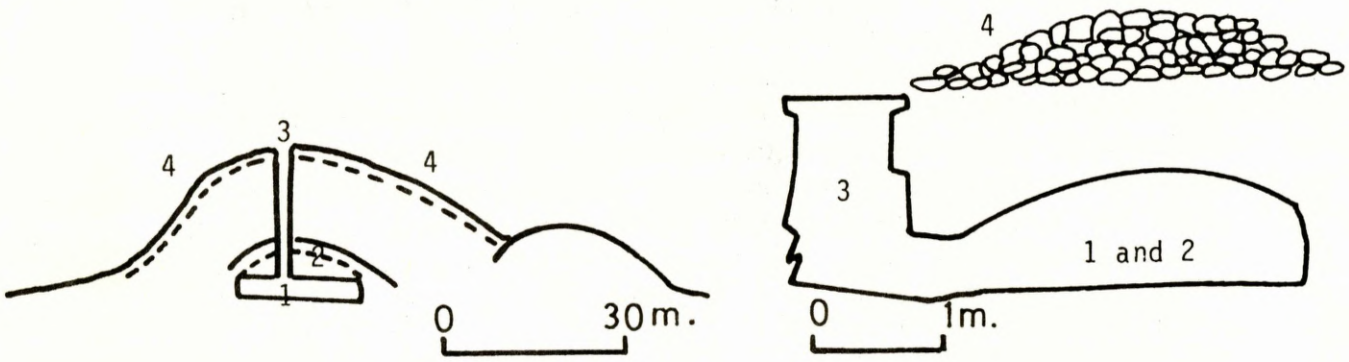
In dry savanna areas to the southeast of the lake region, burial under smaller earthen mounds is reported. Desplagnes states: "En effet, l'emploi de tumulus comme monument funeraire a été d'un usage constant aux temps pre-islamiques chez presque toutes les populations des plaines nigèriennes et soudanaises" (1907: 53-54). Urvoy mapped over eighty tumuli located along present or ancient distributaries of the Niger between Sokolo and Niafunke (between approximately 15°N, 6°W and 16°, 4°W) (Mauny 1961: 97). It has been suggested, however, that in at least some instances Urvoy confused funerary tumuli with habitation mounds on the flood-plain (Szumowski 1957a: 227). Desplagnes noted funerary tumuli in the lacustrine district, and at the western frontier of the inundated plain, as well as on high ground (Desplagnes 1903: 151-2; 1907: 55). We know little more about the geographical setting of these monuments or of the significance of local groupings of tumuli (e.g., why some are single and others arranged as a semi-circle of smaller mounds around a principal tumulus). Mauny has inferred that most large tumuli were built before A.D. 1240; we are still very uncertain about the chronology of their construction and whether they reflect local political and social developments or commercial ties with the Mediterranean as Desplagnes believed (Desplagnes 1903: 153-5, 169-71; Mauny 1961: 92-5; 1978: 280, 321).

Once we pass from the Sahel and dry savanna regions into the wooded savanna beginning just north of 13° latitude, we encounter another major zone of tumuli which, until this point, have been categorized on the basis of their sub-surface characteristics; these are the "hypogea" described by Mauny (1961: 127). "Hypogeum" (any underground chamber), has become restricted in Africa to certain types of rock-cut tombs. The "hypogea" of the Western Sudan are domed burial chambers several metres long, cut out of block laterite, access to which is provided by a vertical shaft slightly less than one square metre in area. The tombs are covered with small stone tumuli similar if not identical in form to the basinas of the Sahara and it can be convincingly argued that the differences between the "hypogea" and other tumulus burials to the north are superficial.

The tumulus shown in Fig. 2.1 consists of four main components revealed by excavation: 1. a funerary chamber; 2. a domed roof of wood and straw; 3. a vertical shaft extending from the mound surface to the funerary chamber; and 4. a tumulus, the clay surface of which is fired to extreme hardness. These four components are also present in "hypogea", although they are translated into other materials. The distribution of "hypogea" on the lateritic hardpan areas of Guinea-Conakry, southern Mali, Upper Volta and parts of northern Ghana (Davies 1967: 293) explains the altered features of the tumulus burials of the wooded savanna. In this region, hardpan may extend to a depth of several metres, with only the thinnest of soil cover (Morgan and Pugh 1969: 194). Under these circumstances, an earthen tumulus is quite out of the question, and the requisite funerary chamber with a protective domed roof is efficiently provided by digging into the laterite itself.

Excavated "hypogea" have contained iron and so could date anytime from the beginning to the end of the first millennium A.D., at which point they were progressively abandoned in favour of Islamic rites (Mauny 1961: 129). A radiocarbon date of 1420 ± 100 a.d. (Hv-3874) for a "hypogeum" southeast of Bamako may be taken as an indication that some of the tombs were still

in use at that date (Liesegang 1975a: 27-8). On the other hand, this date was obtained on bone, which has a tendency to yield young dates. Additionally, because it is an isolated date, it should be viewed with caution.



Tumulus of El-Oualedji
(from Mauny 1961:96)

Hypogeum near Tienra
(from Aris 1950:65)

Figure 2.1 Structural comparison of earthen tumulus and a hypogeum

The above treatment of tumulus distributions (see Map 2.1) implies the existence of a widespread Iron Age tumulus tradition in Mali. Such a tradition may or may not approach the reality of the Iron Age situation in the Western Sudan. Distribution maps can be deceptive at the best of times, and this particular map is based on a mere handful of excavations. A great deal more research is required before we know the percentage of visible tumuli which actually had a funerary function. Similarly, the smaller southern tumuli are difficult to find in the heavier vegetation of the wooded savanna.

Perhaps the most poorly understood region in all Mali is the Sahelian sector encompassing the Inland Niger Delta, which remains unshaded on Map 2.1 In this area, small earthen tumuli lacking a fired surface would have been ravaged by intense wind and water erosion. Therefore, extensive, careful investigation is necessary before we can state whether tumuli were placed over tombs in the Inland Delta. It might be noted here that a probable funerary tumulus with subsidiary earthen mounds arranged around it was located near Jenne during the 1977 regional survey in the western Inland Delta (vide infra, Part ii: Chap. 5). However, the major mode of pre-islamic funerary practice in this area appears to have been interment in large urns.

The number of burial urns excavated in the Inland Delta is extremely small (see Table 2.3), however, as early as 1907 Desplagnes noted: "Sur les bords du Niger, dans les ruines d'anciens villages, on voit frequemment de ces grands canaris renfermant de fragments d'ossements humains" (Desplagnes 1907: 47). Subsequently, a number of archaeologists have commented on eroding burial urns near Mopti (Frobenius 1929: 95-99; R. Guitat - reported in Monod 1955: 33), Jenne (Vieillard - reported in Monod 1955: 32), and immediately upstream from Ke-Macina (Mauny and Daget - reported in Monod 1955: 33). All burial urns which have been excavated from areas subject to seasonal inundation in the region of the Inland Niger Delta are similar in form and burial ritual. The urns themselves are large (>40 cm high), ovoid to slightly globular in shape, with wide necks and mouths and thick walls. Often, they are decorated with indistinct cord rouletting (referred to as barakalé by Szumowski). The corpse was placed in the bottom of the jar, which was covered with a lid or an inverted pot. Grave goods are rare.

Immediately to the west of the Inland Delta, a number of urn burials have been excavated which differ substantially in burial ritual from the group described above. It is perhaps significant that no burial of this second type has been found in the alluvial zone. Because these tombs are marked by a small earthen tumulus, they have been included in Table 2.2. The burials consist of several small pots less than 35 centimetres in height which are clustered around a central burial urn containing burned human bone. The majority of the pots have severely constricted necks, flaring rims, and are slipped rather than cord-rouletted. The small pots contain varying amounts of grave goods, including iron, copper and silver jewelry, grinding stones and beads. The deposits surrounding the urns are in every case ashy and full of burned animal bones and cereal offerings. Burials of this type have been found at Bango, Fetokolé, Sevara-lodé, Péhé and Tougou (see map - App. III).

At present, the geographical distributions of these two kinds of urn burials, as well as pot types and burial ritual, are clearly differentiated. The presence of clay pipes at the Bango site, indicating that interment post-dated the introduction of tobacco in c. 1600 A.D., and the radiocarbon results for the burial urns at Doupwil (15th century A.D.) suggest that the two burial traditions were not widely separated in time and may have been at least partly contemporaneous. It is highly probable that the urn burials of both groups fall entirely within the later Iron Age.

At least two other burial practices are recorded from the Inland Delta: pit graves with tuyères, and flexed inhumation. Flexed inhumation is known from Ségoubougou (Szumowski 1957a: 253). Pit graves with tuyères extending above ground level ("pour faire correspondre le mort avec le monde vivant extérieure" - Szumowski 1956a: 33) have been located at Nantaka and Fatoma no. 4 (Szumowski 1954, 1956a), although no excavation was undertaken because the tombs were assumed to be of fairly recent date. Desplagnes wrote at the turn of the century that tuyères were still used by the "Koron-goi" fishermen of the Niger and Bani Rivers for the pouring of libations and offerings to the dead. At Jenne, the use of tuyères is very much in evidence at the present Muslim cemetery, where they are erected as stelae. The question of how

TABLE 2.3. Funerary urns excavated from the Inland Niger Delta

Site	Excavator and Publication date	Description
Fatoma	Szumowski 1954	#1 - 2 globular pots contained human bone. No grave goods. Iron found in associated occupation area.
		#3 - several large ovoid urns, each covered by an inverted pot. No grave goods; skeletal remains in bottom. Barakalé and geometric decoration.
Kami	Szumowski 1955	#1 - large ovoid funerary urn 40 cm high. Barakalé decoration. Human remains at bottom; 2 copper rings.
		#2 - large urn 62 cm high, barakalé. Human remains at bottom, no grave goods.
		#3 - small globular urn 26 cm high containing human bone. No grave goods.
Doupwil	Bedaux 1976	large urn covered with inverted pot, contained 1 skeleton in forced contracted posture. Iron bracelet and ankle ring.
Temouna	Monod 1955	#1 - ovoid urn 68 cm high with human skeleton in poor condition, no grave goods.
		#2 - large ovoid urn 82 cm high with lid. Skeleton at bottom; no grave goods.
Soyé	Barlet 1949	Covered urn 60 cm high with remains of infant. Bones broken before interment. No grave goods.
Galia	Bedaux 1976	13 large burial urns excavated. Details not given.
Diondori	Sarr 1972	Several large funerary urns excavated: twine-decorated and covered either with lid or small inverted pot. No grave goods. Infant burials in smaller pots.

long tuyères have been used in burial practice has not been resolved, despite the assertion by Szumowski that large urn burial, small urn burial, and tuyère burial may be placed in ascending chronological order. (Szumowski 1957a: 253). We have searched his reports in vain for stratigraphic or any other kind of evidence that would support this contention.

At cemetery sites, as well as at the very few occupation areas that have been excavated in the Inland Niger Delta, emphasis on 'pretty', unusual, or imported artifacts has been particularly marked in excavation reports. Normally, excavated data were recorded only if they fell into one or more of these three categories or were fossiles directeurs. Pottery was photographed only if it was intact (cf. Szumowski 1954, 1955, 1956a). A number of Szumowski's published reports do, however, have excellent drawings of the most ornately decorated sherds recovered in the course of excavation. Unfortunately, lack of detail on provenience or stratigraphy makes even a preliminary assessment of change through time quite impossible. Prior to 1978, the data available allowed only the following general statements to be made about the Iron Age archaeology of the Inland Niger Delta: It appears that many of the large mounds which rise above floodplain in this region are in fact tells, composed entirely of occupational debris. The mounds vary widely in size, from 150 metres to almost a kilometre in diameter, and most show surface indications of discrete habitation and cemetery areas. None of the mounds excavated has yielded a Neolithic component, and the possibility must be considered that tell accumulation in the Inland Delta is a completely Iron Age phenomenon. The presence of smoking pipes in upper levels at some sites indicates abandonment after A.D. 1600. However, in the absence of pipes, few, if any, statements can be made about the chronology of a particular mound.

Extensive archaeological research, supported by a reliable series of radiocarbon dates, has been accomplished in only one region of Mali, the Bandiagara highlands located east of the Inland Delta. Here, a team of investigators from the Institute of Human Biology in Utrecht has conducted several field seasons of excavation between 1964-1971 in the 'Tellem' caves, which were used primarily for burial. A major consideration of the Tellem project has been the recovery and measurement of human skeletal material in order to determine the genetic relationship of the Tellem people to present-day groups in the area (Huinziga et al. 1967). A good series of radiocarbon dates for the skeletal material and associated cultural remains has been forthcoming, with a firm cluster of dates in the eleventh to fourteenth centuries A.D. (Willett 1971: 368-9; Bedaux 1972: 151). The cultural material recovered is still under analysis, and the bulk of it, including pottery, beads, and metal artifacts, remains to be published. Preliminary reports, however, (Bazuin-Sira 1968; Bedaux 1974) indicate that there are marked similarities in the pottery shapes and decorative repertoire recorded from the Bandiagara and the 1977 Jenne-jeno excavations.

A more restricted archaeological investigation was conducted by the Utrecht researchers in the Inland Niger Delta during a two-month period in 1975. Again, a major goal of the research was the efficient recovery of skeletal material (Bedaux 1976b: 1). Much of the work at the two mounds

selected for investigation, Toguéré Galia and Toguéré Doupwil, focussed on cleaning stratigraphic sections already exposed by local quarrying for mud brick or by river downcutting. Also of interest was the retrieval of numerous funerary urns visible in these sections. Despite the necessarily limited goals of the research at Doupwil and Galia, Roger Bedaux has apparently wrung every available bit of information from the deposits to produce one of the more complete site reports from West Africa.[1] Thus far, a series of ten radiocarbon dates is available for the two mounds. Three of these dates have been rejected by the excavator as too old (Bedaux 1979: 34); the remaining seven dates indicate that both sites were occupied from the twelfth to the sixteenth centuries A.D.

This general survey of the state of Iron Age research in Mali demonstrates that a major lacuna exists in our knowledge of that period. Prior research emphasis on historical sites has resulted in a complete lack of data on the 'silent millennia' (1000 B.C. - A.D. 1000) which preceded the rise of empires centred on the Inland Niger Delta. An additional problem is the extreme bias manifested in the selection for investigation of highly visible tells and funerary tumuli along the Niger and Bani River. This has produced a marked geographical clustering of archaeological activity within Mali (clearly visible on the map accompanying App. III) and has ensured that our knowledge of the Iron Age cultures of Mali is restricted to only certain kinds of sites within certain small areas. The ultimate obstacle to an understanding of Mali's later prehistory is the fact that relatively few investigators have been inclined to excavate (preferring surface collection) and very few of those so inclined have displayed any appreciation of horizontal or vertical control while excavating. Thus, a basic framework for the later prehistory of Mali remains very much out of reach. There is no established sequence of Iron Age material anywhere in Mali, and all pre-A.D. 1000 radiocarbon dates obtained up to this point have been either single, isolated dates, or unpublished, or both.

NOTES

1 Bedaux, R. M. A., T. S. Constandse-Westermann, L. Hacquebord, A. G. Lange, and J. D. van der Waals, 1978. "Recherches archéologiques dans le Delta Intérieure du Niger". Palaeohistoria XX: 91-220.

This publication appeared in early 1980 and became available to us immediately before going to press. Therefore, our discussions in this monograph of Bedaux et al.'s research are based on the materials cited in the bibliography.

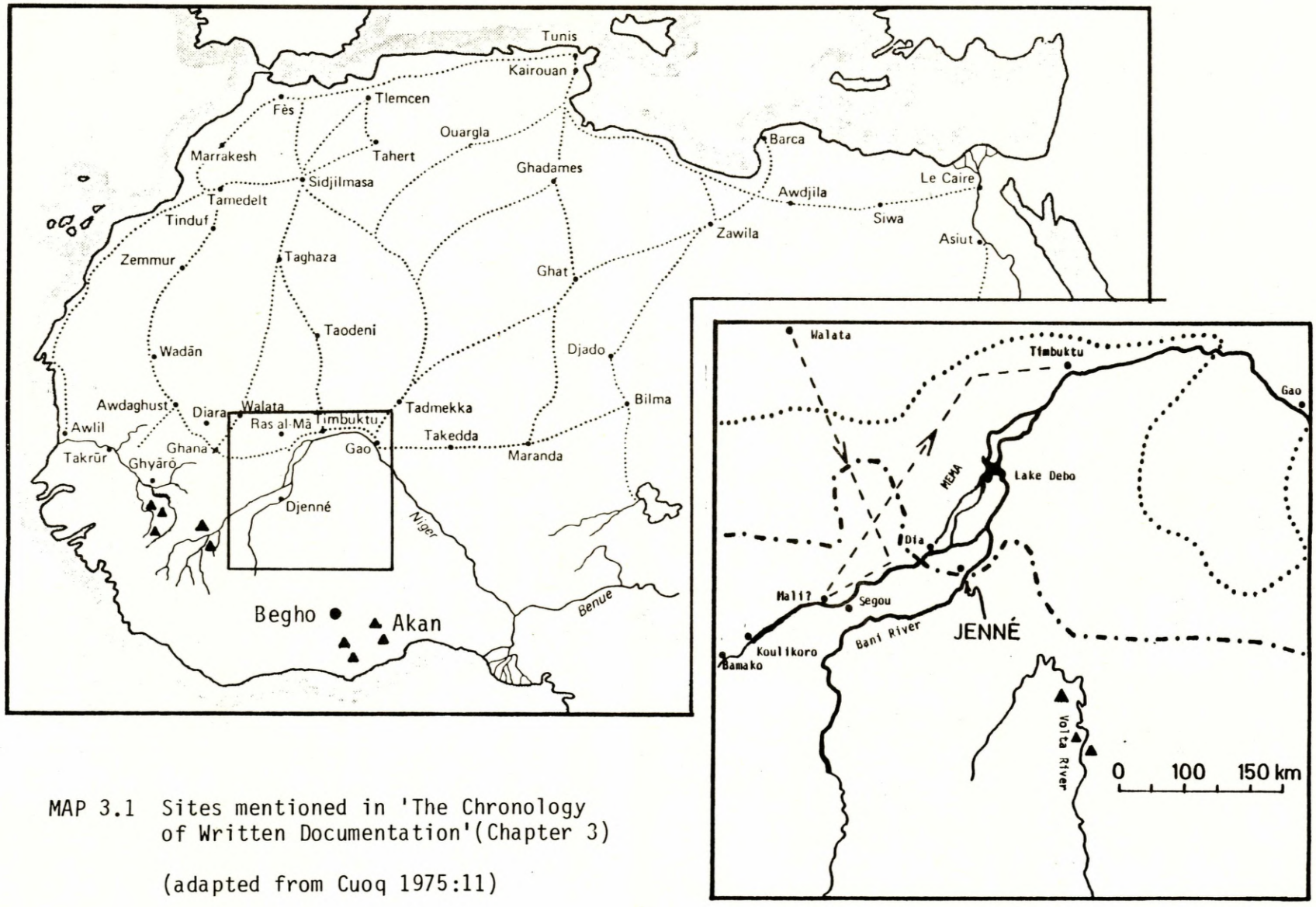
CHAPTER 3

JENNE IN HISTORY

As we have shown, archaeological research in the Inland Niger Delta prior to 1977 offers few insights into the nature or chronology of the development of the Jenne region. We turn now to the historical sources for the Western Sudan in a search for further information concerning the origins of the city, the reasons for its growth, and its function within the extensive trade networks of the second millennium A.D. The available written sources include: the scholarly compendia of medieval arab geographers and historians based in North Africa, Spain, and the Near East, local histories (ta'rikhs) written in Arabic by native African scholars, European accounts, European cartography, and indigenous oral traditions. This chapter begins with a section devoted to the chronology of written documentation; sources making specific mention of Jenne are outlined and the type of information they offer about the city is discussed. Preparation of this section was greatly facilitated by an excellent recent summary of the European sources, including cartographic ones (L. P russin 1973). A second section offers an historical sketch of major events known to have affected the Jenne region, including political developments. The final section considers documentation relevant to the question of Jenne's origins. Particular attention is paid to the conflict between historical reconstruction and oral traditional concerning the date of Jenne's founding.

The Chronology of Written Documentation (Map 3.1)

The earliest details on the Western Sudan are provided by Arab geographers and historians, none of whom, it must be said at the outset, mentions Jenne by name. From the works produced between the eighth and fifteenth centuries A.D., a fairly detailed picture emerges of major political, ethnic, and religious divisions in the Sahara and of important entrepots and oases along the important trade routes from North Africa to the southern trans-Saharan trade termini of Awdaghust, Walata, Ghana, and Tadmekka. The commodities passed along these trade networks are enumerated: silk, safran, wood pine, cowries, glass beads, resin, salt, and copper bracelets and rings were exported from North Africa by Arab merchants who exchanged them at the southern Saharan termini for gold, slaves, ivory, ebony, elephants, and goatskin brought from the Bilad al-Sudan (Land of the Blacks) by native merchants (al-Zuhri, in Cuoq 1975: 115; Yakut, in Cuoq 1975: 182). The transfer of commercial control from Arab or Berber hands to black hands in the southern Sahara is reflected in the Arab sources by a decline in the amount of the precision of detail given for trade routes and commercial centres south of the Sahara. Ibn Hawqal's Saharan itinerary, for example, in quite accurate with respect to travel time between Sijilmasa, Awdaghust, and Ghana, but travel times between the Sahel/northern savanna centres of Kugha, Sama,



MAP 3.1 Sites mentioned in 'The Chronology of Written Documentation'(Chapter 3)

(adapted from Cuoq 1975:11)

KEY TO MAP 3.1


Sources of gold

Major trans-Saharan trade routes--
X-XIV centuries A.D.

Southern limit of Sahara (or Saharan Sahel)

Southern limit of Sahel (or Sudanic Sahel)

Ibn Battuta's itinerary as reconstructed
by Hunwick


Navigable Niger/Bani


Non-navigable Niger/Bani

Kuzam, and Kawkaw are enormously exagerrated (Ibn Hawqal, in Cuoq 1975: 73). Reports on towns near or on the 'Nile' (i.e., either the Niger or Senegal Rivers) are almost invariably vague, if not downright contradictory. In general, the quality of Arab knowledge appears to decrease rapidly with distance south of the southern Saharan entrepots and cities. This is scarcely surprising in view of the fact that most Arab compilers never left their native lands of Spain, Ifriqiya, Egypt, or Syria and depended largely on second- or third-hand reports from merchants or travellers for their information. The southern frontier of Arab knowledge of the Western Sudan seems to be the Senegal and Niger Rivers, which the Arabs believed to be but one river, the Nile, ultimately flowing past Cairo and into the Mediterranean. South of the river, the Arabs knew only that a pagan tribe of blacks, the Lamlam, lived. Beyond the Lamlam lay uninhabitable desert.

It is difficult to know how much of the vague reportage of sub-Saharan Western Sudan by Arab authors stems from genuine ignorance and confusion (possibly created in part by deliberate obfuscation on the part of black traders seeking to conceal the trade routes to the gold fields), and how much is a function of selective reporting. It is possible that the towns of black Africa held little fascination for the Arab authors, most of whom wrote for royal patrons who possessed large numbers of black slaves. Since many black societies were pagan, Arab authors may have avoided detailed treatment of them. In the introduction to Ibn Hawqal's Surat al-Ard, we find an example of this attitude: "I have not described the countries of the blacks in the West ...because the characteristics or organized states, such as religious, cultural and legal institutions and stabilized governmental institutions, are utterly lacking among them" (translated in Trimingham 1962: 2). Whatever the reason, the pattern of vague and confused reportage for sub-Saharan regions is sufficiently consistent in the Arab sources that we may conclude that their failure to mention Jenne cannot be assumed to mean that the town was not yet in existence.

A notable exception to this line of reasoning must be mentioned, however: unlike other Arab authors of this period, Ibn Battuta actually travelled through the Western Sudan (in A.D. 1352-3) to the capital of the kingdom of Mali and thus provides numerous details on the towns through which he passed. Although he visited Walata, Timbuktu, and Gao in his travels, Ibn Battuta makes no mention of Jenne. Must we conclude then that Jenne either did not yet exist or was unimportant at this time? Not necessarily. As excellent as many of Ibn Battuta's description's are, there are large gaps in his narrative wherein a journey of many days' duration received only a paragraph's notice. His month-long stay in Gao (which he calls the 'most beautiful city in the Sudan, and the largest and richest also') merits only seven sentences (Ibn Battuta, in Cuoq 1975: 316). Either his daily journal or his memory was very selective, although part of the problem must surely be, as Mauny et al. (1966) have pointed out, that Ibn Battuta's notes from twenty-four years of world travel were dictated to a professional writer in Fes who produced a synthesis in only three months' time.

Ibn Battuta's account of his trip both to and from Mali is particularly sparce in detail; as a result, his itinerary has been the subject of substantial debate. Delafosse (1924) argued that Ibn Battuta entered the Inland Niger

Delta after crossing the Niger southwest of Jenne, from whence he travelled to Ségou and on to Mali. If this were true, Battuta's failure to mention Jenne would strongly suggest that the town came to play a critical role in riverine transport in the upper Inland Delta only after the mid-14th century. However, both Meillassoux (1972) and Hunwick (1973) offer interpretations of Ibn Battuta's itinerary that keep him well to the north of the Inland Delta. We incline to support Hunwick's reconstruction, which emphasizes the important point that neither on his journey from Walata to Mali nor en route from Mali to Timbuktu did Ibn Battuta mention crossing the Niger River. If Hunwick's interpretation of the traveller's southward itinerary is correct, Ibn Battuta approached the Niger River from the north at a point well to the southwest of Jenne, but never crossed the Niger or travelled in the Delta. His return from Mali would have taken him well to the north of the Niger, via Mema, until he reached the Niger again at Timbuktu, from whence he travelled by pirogue (flat-bottomed boat) downstream to Gao. Given that Ibn Battuta travelled overland, probably to the north of the Inland Delta, it is not particularly significant that he does not mention Jenne, since we would necessarily expect him to do so only if he travelled through the Inland Niger Delta by boat, which he clearly did not. Although it initially appears puzzling that Ibn Battuta should have travelled overland rather than taking advantage of the efficient riverine transport, especially between Koulikoro and Timbuktu, it may well be that his journey, in the company of a merchant, merely reflected the seasonal shift in routes as the water level became too low for successful commercial transport along the Middle Niger. The flood season (mid-July to December) offers maximum navigability along the Upper and Middle Niger (Champaud 1961: 259). Ibn Battuta travelled from Mali to Timbuktu in late February/early March(Cuoq 1975: 289, footnote 1). Claims to the effect that Ibn Battuta's overland itinerary proves that the Middle Niger had not yet developed by the mid-14th century as an important transport axis should be reconsidered.

In general, factors of selective reporting and the northern perspective of Arab authors (focussing on overland trade routes to the north of the Niger, particularly trans-Saharan routes) help account for their failutre to mention Jenne. We must wait until A.D. 1493-6 for mention of Jenne in an Arab archival source. A Moroccan, al-Maghili, wrote a long epistle to the Askia Mohammed, ruler of the Songhay Empire, concerning the proper conduct of a Muslim ruler and his subjects. On the topic of preventing public nudity, al-Maghili writes: "the ruler must observe his subjects day and night, in public and in private. This is not spying upon Muslim followers, but guarding the many from the evil few, particularly when the offense is as widespread as at Timbuktu, Jenne, and other places" (Cuoq 1975: 430 - translated from the French by R. J. M.). Interesting as this may be, it tells the reader little about the history of the town. From it we might guardedly surmise that Jenne was large and its population urbane enough to harbour such evil or at least large enough that the traditional habits of the inhabitants would have att racted attention (whereas they might not in a small, traditional village). It also appears that the traditional tie between Jenne and Timbuktu was fixed in the mind of al-Maghili.

The first European reference to Jenne as a city occurs in a letter sent from Tuat (Algeria) in 1447 by the Italian merchant, Antonio Malfante. The

letter, written in Latin, mentions various civitates bordering the land of the Blacks, including Chuchiam (Gao), Thambet (Timbuktu), Geni (Jenne), and Meli (Mali) (Crone 1937: 87; original letter reproduced in La Roncière 1924; 152-3). As Prussin (1973: 66-7) points out, the interpretation of the term civitate is extremely ambiguous. Civitate may be translated as city or state, although Malfante's connotation of the term presumably was closest to that of the 15th century Italian city-state. Although Malfante gives no information on the location of Geni (La Ronciere first proposed the equation of Geni with Jenne in 1924: 148), several other details in his narrative suggest that his informant, a wealthy merchant who claimed to have lived in Timbuktu for thirty years, was specifically describing the Inland Niger Delta when he spoke to Malfante of the Land of the Blacks. Malfante recounts:

> Every day he (the informant) tells me wonderful things of these peoples (the Blacks):...they all go naked, save for a small loin-cloth to cover their privates. They have an abundance of flesh, milk, and rice, but no corn or barley. Through these lands flows a very large river, which at certain times of the year inundates all these lands. This river passes by the gates of Thambet...There are many boats on it, by which they carry on trade (Crone 1937: 88).

The seasonally inundated land upstream of Timbuktu which produces a great abundance of rice can only be the Inland Delta. Thus we learn two important facts from Malfante's letter: trade by pirogue was common on the Niger between the upper Inland Niger Delta and Timbuktu in the mid-15th century; and the majority of the people in the Inland Delta were not Muslim—i.e., they went naked. Malfante's informant was, however, either unable or unwilling to provide him with details of the gold trade. In response to Malfante's frequent inquiries about the location of the Sudanese gold fields, his informant always replied: "I was fourteen years in the land of the Blacks and I have never heard nor seen anyone who could reply from definite knowledge" (Crone 1937: 89). It may be that the blacks among whom the Arab informant lived practiced a conscious policy of concealing information on the gold sources from outsiders; it is also possible, however, that the merchant perceived the motive behind Malfante's probing questions concerning the gold trade and provided no information that might encourage commercial competition. Malfante's mission in Tuat was apparently to reconnoiter a commercial route to the interior of West Africa in order to secure gold at its source for Italian interests before it could reach Portuguese merchants on the Guinea coast (Levtzion 1973: 133). Malfante's explicitly southern, sub-Saharan interests might help explain why he mentions Jenne, whereas other, Arab writers availing themselves of informants in North Africa fail to do so.

Much greater detail on Jenne is available in two early 16th century Portuguese accounts, those of V. Fernandes (1506-7) and Pacheco Pereira (1506-8). Both these writers were seamen employed by King Joao II of Portugal to explore riverine routes to the heartland of the gold trade in the interior of West Africa. Fernandes specifically mentions the desire of King Joao to reach the cidades of Tambucutu (Timbuktu) and Jyni (Jenne) via the Senegal River, which he clearly believed to be connected to the Niger. Despite the fact that all Fernandes' information was second-hand, his description of the trade network linking Jenne to Timbuktu is detailed and accurate. He

hinterland. However, the sources provide little satisfactory indication as to the early chronology of the city's development.

Historical Sketch of Jenne (Map 3.2)

Although the early centuries of Jenne, particularly those prior to Islamization, remain obscure, a reasonably concise summary of political events after the thirteenth century can be reconstructed from the various sources already cited in this chapter. A very useful city history had been produced in Jenne, using information from the ta'rikhs mentioned earlier. Entitled "Summary of the History of Jenne from the Foundation of the City to the French Penetration", this admirable document was made available to us by Mr. Hama Bocoum, director of the Ecole Supérieure de Jenne. Reproduced below is that portion of the document which deals with the last seven centuries of Jenne's existence (translated from French by S.K.M.):

Jenne in Contact with the Western World

a. Islam: Under the influence of Islamised Marka merchants, Koi Koumboro converted to Islam in A.D. 1240, becoming thus the first Muslim chief of Jenne. Islam then became the religion of the state. Koi Koumboro gave up his palace in order to construct the first mosque. The original mosque was in existence until A.D. 1810.

b. Mali: Hithertofore independent, Jenne was unable to escape the wave of Malian conquest that spread across West Africa. Thus, the region was part of Mali in 1325, as were Timbuktu and Gao. But the Manding sovereign was only represented there (Jenne) by a dignitary of the second echelon who enforced the emperor's decisions and collected taxes.

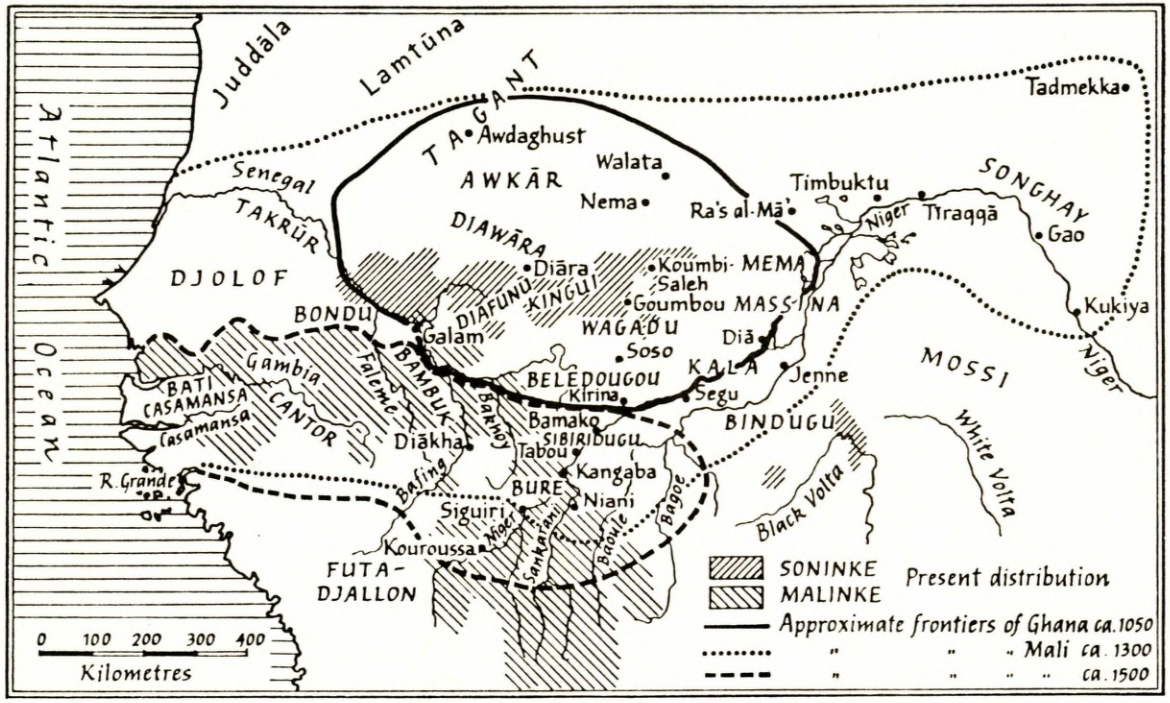
From this contact, Jenne benefitted and developed owing to the visits of large numbers of foreign Muslim merchants. Islamic law was exalted by these merchants and Manding pilgrims, and paganism was definitively supplanted with the conversion of Koi Koumboro and the inhabitants of Jenne.

c. Songhay: At the end of the fourteenth century, the prosperity of Mali declined as a result of civil wars that erupted with the death of Mansa Souleyman. Jenne, at the head of many vassal towns, claimed her independence. But in 1468, the city fell into the hands of Sonni Ali Ber after a seige of seven years, seven months, and seven days.

d. The Moroccans: In 1591, Moroccan troops commanded by Djouder routed the Songhay at Tondibi (12/4/1591). This victory marked the end of a powerful empire. The Moroccans then headed for Jenne, the city that was the pride of all the emperors of the Sudan. Upon arrival, the Moroccans settled in the Sankoré quarter where they built their palace in an eastern architectural style. Their descendants, the Arma, bear the family name Touré.

The Moroccans engaged in idolatry and consumed enormous quantities of hydromel.

The style and organization of the houses and the pottery owe much to the Moroccans. They also influenced clothing and, from a military



MAP 3.2 Jenne and the Empires of Ghana and Mali
(N.Levtzion, Ancient Ghana and Mali 1973:2)

point of view, the use of firearms. But the most important Moroccan influence is incontestably the "sacred well" called the "Nana Wangara".

The pasha reigned tyrannically over his subjects and never drank river water. Thus, he had a well dug in the residence of the Crown Prince which he baptised Nana Wangara after his favourite (Nan di signifies "favourite" in Songhay, and Wangara was his real name).

e. The Fulani: After 1810, Seku Amadu controlled the Macina and replaced the Moroccans at Jenne who were at that time commanded by Alkaid Boubacar Touré. The numerous mosques that had sprung up here and there were transformed into cemeteries. The Great Mosque (of Jenne), judged by Seku Amadu to be impure and soiled, was abandoned and a new one built on the site of the present primary school (from 1815-1906). Traces of the mosque wall are still visible in the school courtyard. The present mosque in Jenne was built by the French administration in 1906-7.

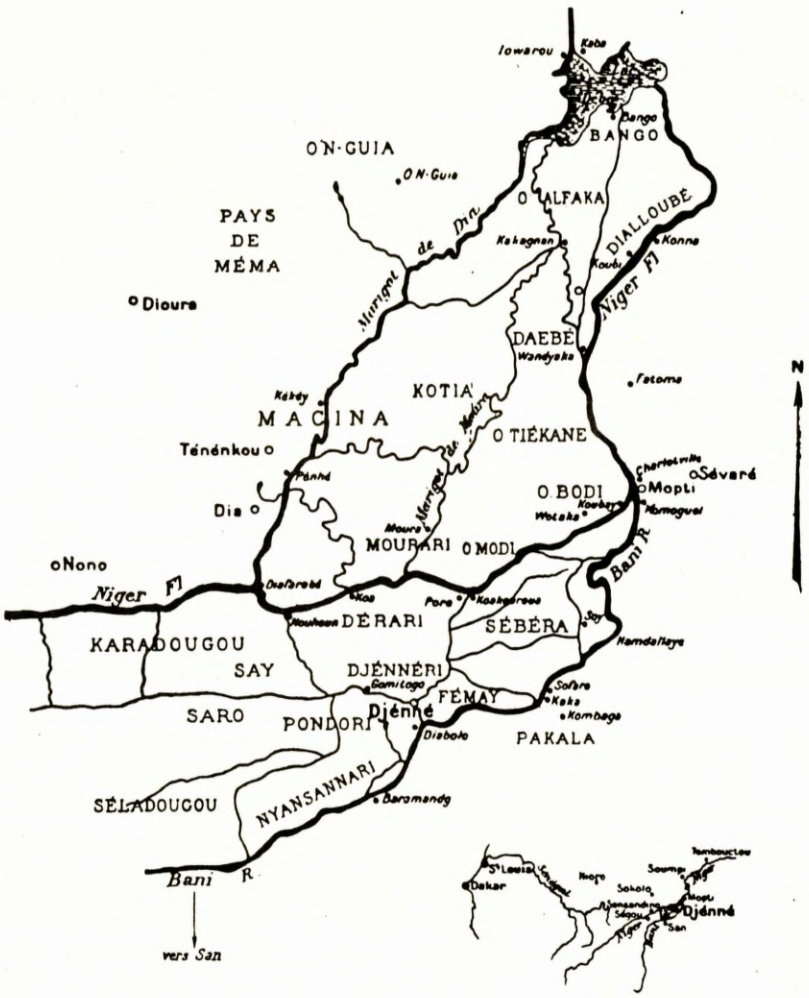
f. The Tukulor: In 1862, Jenne fell under the domination of the Tukulor, with Moussa Fofana as the representative of el-Hajj Omar and later of his nephew, Tidjani.

It was during the period of Tukulor domination that Jenne was taken by the French troops led by Colonel Archinard on 12 April, 1893, after an heroic struggle by the inhabitants, in which the French lost two officers: Lespiaud and the Lt. Dugast. Their graves are situated on a mound facing the Djoboro quarter.

Oral Tradition (Map 3.3)

Unlike oral traditions in many other Mande-speaking parts of West Africa, Jenne's traditions are fragmentary. In the sense of verbally-related and retained chronologies of events passed on from one generation to another in the form of minstrel epics (like those recited by Bambara griots), oral traditions are essentially non-existent at Jenne. The city has no true griots (McIntosh 1979: 32), and it has no unified, coherent tradition of its pre-Islamic history. This is understandable in view of the "multi-ethnic, polyglot, heterogeneous character" of the city (Prussin 1973: 94). Six or more different ethnic groups co-exist in Jenne (Bambara, Bobo, Nono (Marka), Bozo (Sorogo), Fulani and Songhay) without relinquishing their individual sense of ethnic and historic identity. As no group is dominant, no one group has become the guardian of the city's history.

An additional factor which undoubtedly compromised the integrity of earlier oral tradition was the growing influence of Islam and literacy in Jenne. Native Muslim scholars, such as al-Sa'di, transcribed some of the local oral traditions into Arabic, although the pagan past was always discounted. As literacy and Islam spread, the verbal transmission of tradition may have diminished in frequency and importance, especially if the oral traditions were subverted by state-approved, standardized histories like those created by Seku Amadu in the 19th century (Brown 1969: 4-7). Jenne's oral traditions have clearly undergone a good deal of chronological telescoping and political editing through the centuries. However, the details which have survived these processes provide an alternative to slavish dependence on historical documentation for information on Jenne's origins and chronology.



MAP 3.3 The Jenne region
(C.Monteil, Une Cité Soudanaise: Djenné 1971:3)

Three sources furnish the bulk of what is known of Jenne's oral traditions: Ta'rikh es-Sudan, Monteil's Monographie de Djenné, and Delafosse's Haut-Sénégal-Niger. In 1977, we worked with four informants in the city to obtain a basic outline of the earliest periods. These were: al-Hajj Amadou Cissé (A.C.), al-Hajj Ousman Cissé (O.C.), al-Hajj Séku Bela Koita (S.B.), and Hama Bocoum, director of the Ecole Supérieure de Jenne. All but Séku Bela had had some Western education and read both Arabic and French. The first three had spent several years collecting the traditons of all ethnic groups in the city, in recognition of the fact that the old traditions were no longer being maintained. In the words of Ousman Cissé: "Each time an old man dies, a library burns". Seku Bela lamented that the young men of Jenne are no longer interested in learning the oral traditions; they are only concerned with leaving town. In general, the information we collected from these ifnformants agreed well with the overall pattern of oral traditions in Monteil (which two of the informants had read), although details sometimes differed. These details will be mentioned where appropriate.

All accounts agree that Jenne was founded in the 8th century A.D., that the city was first situated on the site of Zoboro and subsequently moved to its present location. The Ta'rikh es-Sudan provides the following account:

> In the beginning, the town had been built in a place called Zoboro; later it was moved to the spot where it still exists today. The former town was situated near the modern town in a southerly direction. ...The town was founded by pagans in the mid-second century A.H. (mid-eighth century A.D.). The inhabitants did not convert to Islam until towards the end of the sixth century A.H. (twelfth century A.D.) (al-Sa'di 1964: 23—translation SKM).

The site of Zoboro is still well-known to the inhabitants of Jenne; it is a mound situated three kilometres southeast of Jenne and also known as Jenne-jeno ('ancient Jenne' in Songhay), Jenne-Sire, Djoboro, Do-Djoboro, and Togguéré Djoboro. There is disagreement, however, over which city is indicated by the eighth century A.D. founding date: Jenne or Jenne-jeno (Zoboro)? Monteil (1932: 33) believes that the eighth century date refers to Zoboro, whereas Trimingham (1962: 31) seems to accept it as the foundation date for Jenne, as did our informant, Ousman Cissé.

Oral traditions collected by Monteil and Delafosse add flesh to the bare bones of al-Sa'di's report. All oral traditions appear to be unanimous in affirming that the Bozo fisherfolk were the earliest inhabitants of the region (Monteil 1932: 29; Delafosse 1912, Vol. I: 253-4). Unfortunately, the Bozo themselves have few historical traditions, as is frequently the case with acephalous societies (Vansina 1967). The fact remains, however, that the Bozo are still considered by all inhabitants of the area to possess unique powers over water genies, by right of being the original settlers in the region (Sundstrom 1972: 49-70). Oral tradition is divided on the issue of whether the Bozo (Sorogo) of the Jenne region have always lived in the area, or issued out of a hole, named Dia, in the Massina (Monteil 1903: 94; 259-61; Delafosse 1912: 253-4). In 1977, we were told by one informant (A.C.) that the Bozo have always been in the Jenne region but by another (O.C.) that the Bozo were relatively recent (although the first) migrants into the area, which had earlier been covered by permanent water.

Zoboro was initially a Bozo settlement (Monteil 1932: 32; Delafosse 1912, Vol. I: 268). Soninke-speaking Nono (Marka) entered the upper Inland Niger Delta from the northwest via Bassikounou and superimposed themselves on the Bozo autochthones, according to the traditions (Monteil 1932: 31). The Nono founded Dia, a 'famous metropolis' from whence Nono groups subsequently budded off to found new towns, including Sansanding, Diakha-sur-Bafing, and Jenne. The Dia immigrants slowly moved into the floodplain, settling in the same villages as the Bozo. Thus, at the Bozo village of Zoboro, a Nono faction commanded by Namankeni settled down and founded the first Jenne (Monteil 1932: 32). The most commonly accepted derivation of the name Jenne is from the Nono "Djanna" (as Jenne was originally pronounced) meaning "little Dia" and thereby commemorating the town from whence the Nono came (Monteil 1903: 263, 286).

The duration of Nono occupation at Jenne-jeno prior to moving the city to its present site is not specified in the oral traditions collected by Monteil and Delafosse. Delafosse hypothesized that the Nono occupied Jenne-jeno only briefly; our informant, Séku Bela, reported that the city remained at Jenne-jeno for three hundred years. Among the various reasons cited for Jenne-jeno's abandonment are: population pressure (Delafosse 1912, Vol. I: 269-70, 320-1; Vol. II: 275; O.C.), indefensibility under attack (S.B.), and a tetanus epidemic affecting all recently-circumcised young men (A.C.). Monteil and Delafosse imply that the move from Jenne-jeno to Jenne had taken place before the conversion to Islam of the 26th chief of Jenne, Koi Komboro, between A.D. 1200-1300 (Monteil 1903: 285; Delafosse 1912, Vol. I: 269-70). In actual fact, all that we can state with confidence is that Jenne-jeno must have been abandoned by at least A.D. 1468, at which time the Songhay conqueror Sonni Ali garrisoned his troops there during his seige of Jenne (al-Sa'di 1964: 26).

Several historians have found it difficult to accept the eighth century date claimed for the city by oral tradition. Delafosse (1912, Vol. I: 269-70) felt that Jenne must have been founded c. A.D. 1250 as a direct consequence of the Soninke dispersal following the destruction of Ghana in c. 1240 by the Mansa of Mali. The Nono, he argued, must have entered the Inland Delta in great numbers at this time. Monteil (1932: 33) suggested that this argument was too flimsy and arbitrary to justify entirely ignoring the oral traditions.

Levtzion (1973: 159) discounts both of al-Sa'di's dates (c. A.D. 800 for Jenne's foundation; c. 1200 for conversion to Islam) as "much too early". He argues that Jenne owed her existence to two things: Timbuktu, and the opening of the Akan gold fields (usually believed to have occurred in the fourteenth century although this is by no means proven). Timbuktu was founded only in the early twelfth century and increased slowly in prosperity until it became very prominent in the fifteenth century. Levtzion reasons that the "close commercial relations between Timbuktu and Jenne suggest that these two important market towns developed simultaneously (Levtzion 1973: 156); thus, Levtzion supports Delafosse's date of A.D. 1250 for the founding of Jenne.

Triaud prefers to see Jenne as an artifact of Islam, founded near the end of the thirteenth century by Muslims in co-operation with indigenes. He dismisses the oral traditions as pure fabrication (Triaud 1973: 128):

> One has the impression that the inhabitants of Jenne, suffering from the late creation of their town, needed to fabricate a history that gave them more ancient origins. Hence, al-Sa'di's report of the mid-eighth century A.D. But most historians estimate that the foundation of the town occurred later than this date. M. Delafosse places the date c. 1250 and attributes it to the Soninke. For Paul Marty, the creation of the town and its conversion to Islam stemmed from Malinke influence, which is quite possible.

Despite decades of commentary on the chronology of Jenne's origins, Monteil's statement (1932: 36) that "we know nothing of the first centuries of Jenne" was still appropriate to the state of knowledge in 1977. The oral tradition vs. historical reconstruction debate was clearly stalemated: archaeological research offered the most promise for resolution of this issue. This was one of several questions we sought to answer to excavating at Jenne-jeno in 1977.

SECTION II

THE EXCAVATIONS AT JENNE-JENO

CHAPTER 4

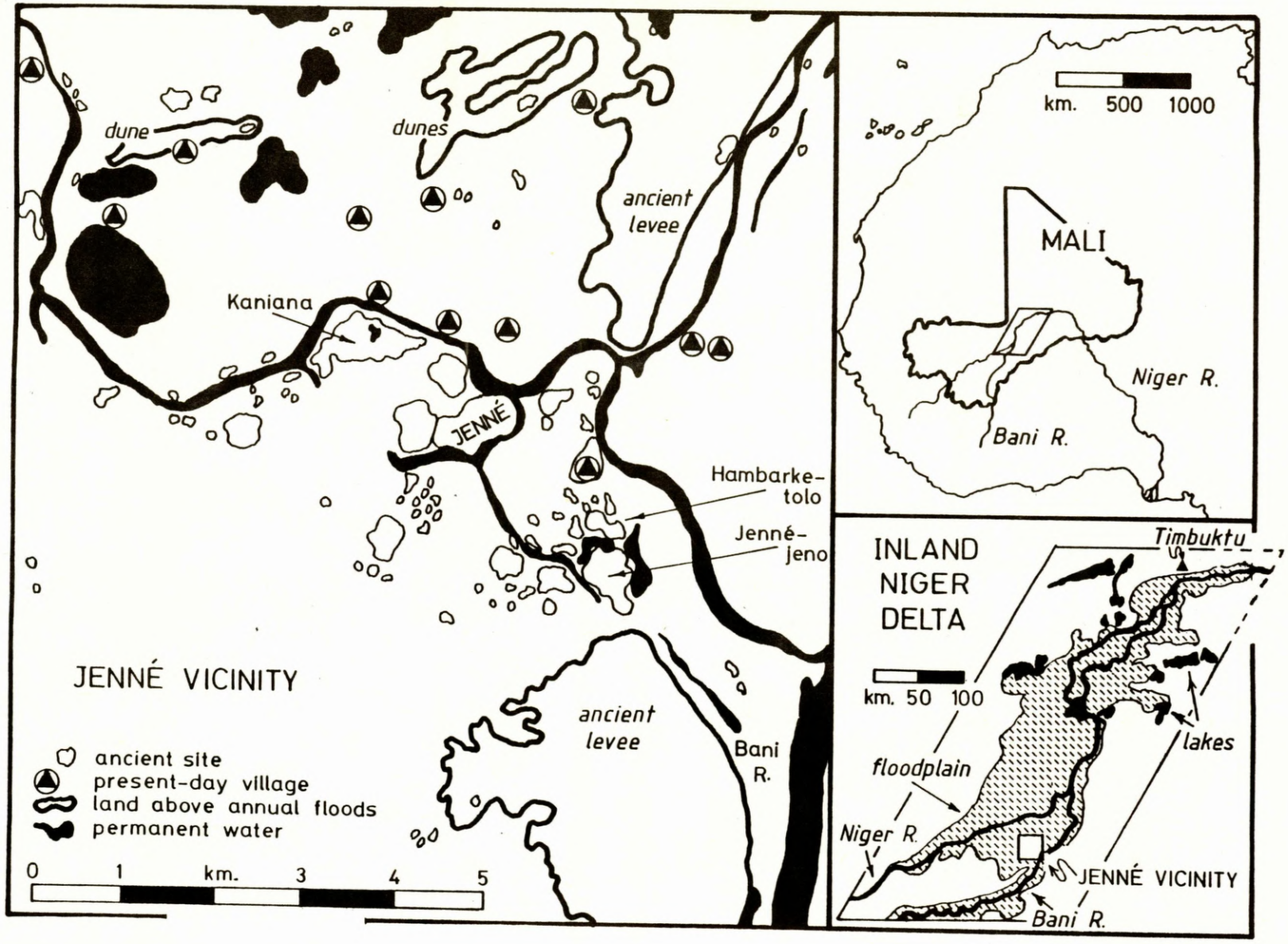
SITE DESCRIPTION AND GEOGRAPHIC SETTING

Site Description

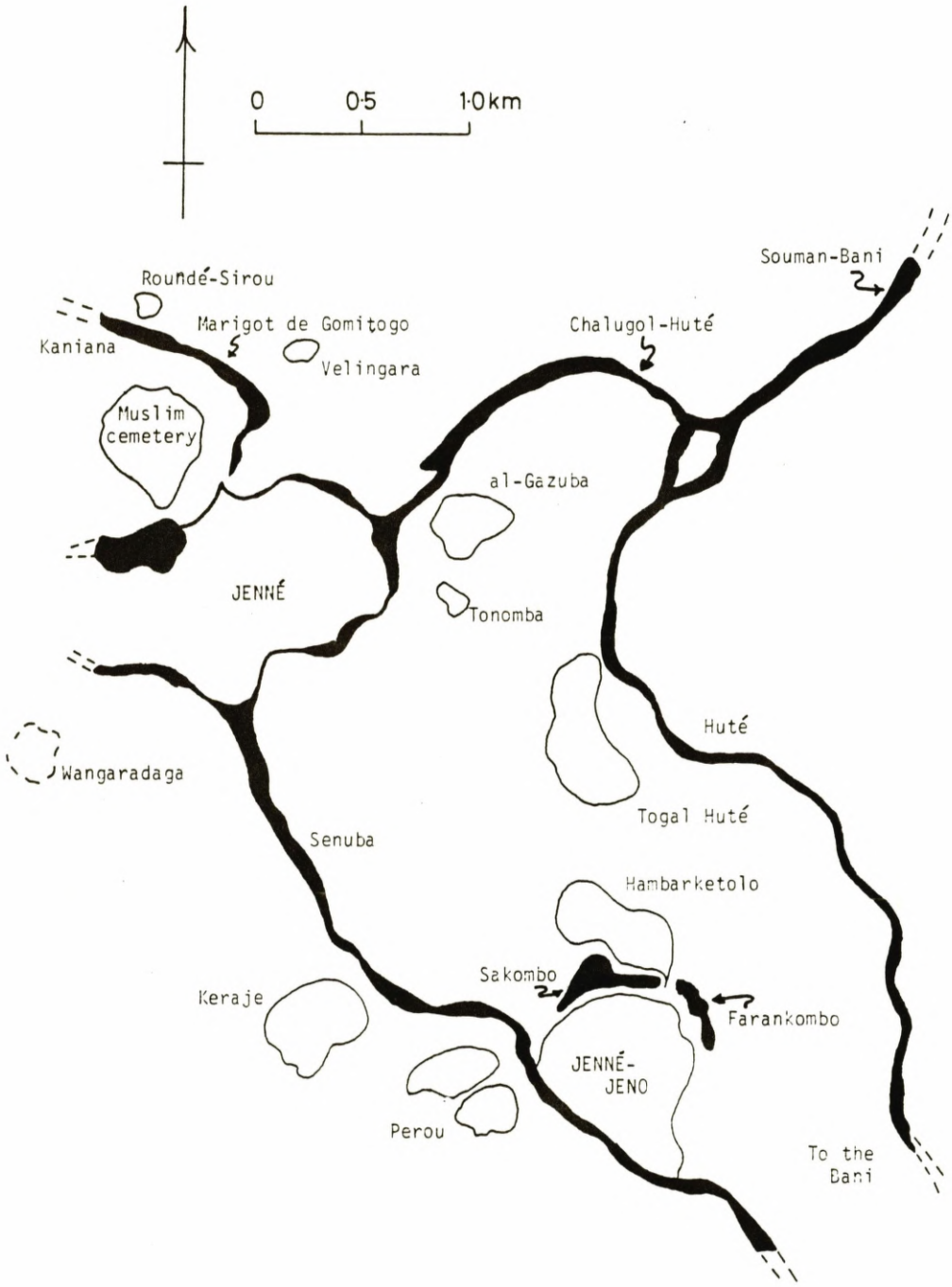
The site of Jenne-jeno is a large mound that rises up to 8 metres above the floodplain of the Inland Niger Delta approximately three kilometres southeast of the present-day city of Jenne (13° 53' 20" N, 4° 32' 25" W, —Map 4.1). The mound rests in an abandoned channel of the Bani River (Map 4.2) which now flows approximately five kilometres to the southeast of Jenne-jeno, and is surrounded by floodwaters from late September through January. A feature important to the location of the site is undoubtedly the Senuba, a seasonal channel immediately west of Jenne-jeno which retains water throughout the dry season. A distributary of the Bani, the Huté (part of the Souman Bani), holds water all year long and lies about one kilometre east of the site. To the north and east of Jenne-jeno are two large seasonal ponds, respectively the Sakombo and Farankombo. The level of the floodplain is approximately one metre lower in these ponds, which may have been created through mud-brick manufacturing activities, resulting in the removal of large amounts of clay from the floodplain adjacent to Jenne-jeno.

Roughly teardrop-shaped, Jenne-jeno measures 760 metres along the longest axis (N-S) and 550 metres E-W. Total surface area of the site is approximately 330,000 square metres. Much of the mound's surface is covered with a thick blanket of potsherds that lends a deep reddish hue to the site when viewed from a distance. Although recent agricultural activities have eradicated surface features over about 40% of its area, large numbers of mud brick house foundations and ceramic funerary urns are visible elsewhere on the surface of the mound, particularly where erosion has been active (Map 4.3). House foundations are round or rectilinear in shape and constructed of either rectangular or cylindrical mud brick; funerary urns are noticeably concentrated along the eastern aspect of the site. Concentrations of iron and slag, pottery, and calcium nodules are present, although it is difficult to know if these are products of differential erosion or past activities. A recent Muslim burial can be seen eroding from the surface in the southeast sector.

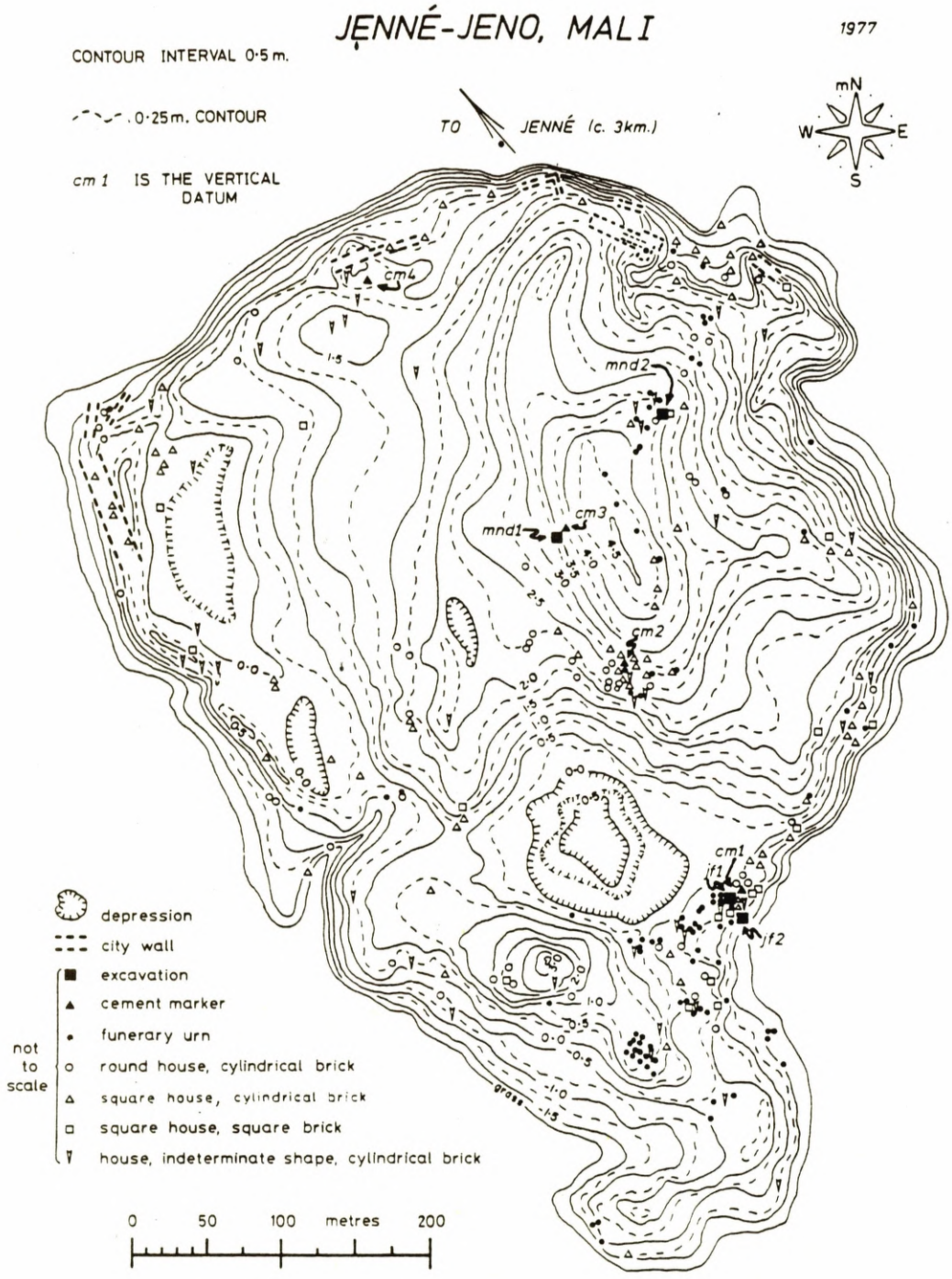
Parts of a city wall constructed of many rows of cylindrical brick are visible at various points on the periphery of the mound; this wall is over eleven metres wide in parts. Two modes of wall construction were identified from the few complete wall sections which remain; an outer shell of several rows of mud bricks was constructed which was then filled with mud rubble, or a solid wall of rows of cylindrical bricks was built. At the northeast edge of the site we have tentatively identified a brick-and-rubble gate to the city wall measuring 18.2 metres in width and 12.3 metres in length.


dune
dunes
ancient levee
Kaniana
JENNÉ
Hambarke-tolo
Jenné-jeno
JENNÉ VICINITY
ancient levee
Bani R.
ancient site
present-day village
land above annual floods
permanent water
0 1 km. 3 4 5
km. 500 1000
MALI
Niger R.
Bani R.
INLAND NIGER DELTA
Timbuktu
km. 50 100
floodplain
lakes
Niger R.
JENNÉ VICINITY
Bani R.

MAP 4.1



MAP 4.2 Features in the vicinity of Jenne



MAP 4.3 Jenne-jeno: topography and surface features

Although it is virtually certain that the surface of Jenne-jeno has been searched over many decades by farmers, shepherds, and children seeking curios such as spindle whorls, beads, and copper ornaments, there was relatively little evidence in 1977 of serious disturbance of the mound. Several recent disturbances by treasure seekers were in evidence, but they were limited in area and very superficial. More serious are the destructive effects of rain gullying and stream undercutting, which are particularly striking along the western edge of the site. Sheetwater erosion and wind deflation have taken their toll as well.

A series of four, metre-high, permanent cement posts had been set into the ground surface of Jenne-jeno on a roughly southeast-northwest alignment, although the posts are not in a straight line. The purpose of these markers could not be ascertained. We labelled them Cement Markers 1-4, moving southeast to northwest. A permanent mark at ground level of Cement Marker 1 was used as the site datum, for which it proved impossible to obtain an exact elevation. The International Bench Mark at Jenne noted as a "point astronomique" (elevation 278 metres above sea level) on the Institute Géographique National map (San sheet) could not be found in 1977. Until that marker is found, we must be content to say that the site datum is 278 $\pm$ 5 metres above sea level at 13° 53' 20" N, 4° 32' 25" W. The site contour lines (Map 4.3) are accurate to within $\pm$ 15 cm. Datum points at the northeast corner of individual excavation units (Mnd 1, Mnd 2, JF 1, JF2 on Map 4.3) are accurate to within the nearest centimetre vertically and to $\pm$ 10 cm horizontally (datum points were cross-checked from two additional and independent stations during levelling).

Geology, Geography, Climate

The Inland Niger Delta is a large Quaternary alluvial basin which directly overlies a mantle of Palaeozoic sandstones and granitic and gneissic Pre-Cambrian basement rock (Tricart 1959). It began to form sometime in the early to mid-Pleistocene when the Bani River, which formerly flowed farther south, was captured by the Niger (Grove and Warren 1968). Annual inundation of the vast area between the Niger and its new tributary occurred as a consequence of the extremely small gradient (approximately six centimetres per kilometre) produced as the Pre-Cambrian basement planes out west of Segou (Kreuer 1966). The diversity of soil types and landforms present in the Inland Delta is staggering (see Part ii: map 4.1). Virtually all of the visible features have been created within the last 20,000 years; they testify to a fairly rapid alternation of dry periods associated with dune formation and wet periods during which the migrating distributaries characteristic of an active hydrological system dissected and reworked continental features and created levee systems. (A comprehensive and up-to-date interpretation of the geomorphology of the IND is presented in Part ii Chapter 3 of this monograph.)

The first glimpse of the landscape of the Inland Niger delta immediately invites comparison with the great floodplains of Mesopotamia and Egypt. In all three, an arid countryside is sliced by a vast ribbon of water whose annual swellings deposit rich alluvial sediments, which in turn support a lush seasonal flora of grasses. Water, alluviation, grasses—"trilogie évocatrice des grandes civilizations antiques" (Gallais 1967: 16). Above the level of general appearances, however, the similarity ends. The floodplains of the Nile and

TABLE 7.2. Tentative Reconstruction of M1 Deposition Event Sequence (related events enclosed by brackets)

LEVEL(S)	EVENT
1/2	accumulated subsequent to destruction of House 2
3	
4	destruction of House 2; post-abandonment accumulation
Hs 2,6,7	House 2 and destruction level
5	
8	tip outside House 2
9/10	possible rapid succession of building and destruction episodes?
11	long period of slow accumulation
12	
13,14	destruction of House 6
17,18	bath area outside House 6
15	domestic debris inside House 6
Hs 6	tauf wall of House 6
16	tip outside House 6
19	domestic debris in pit inside House 6
20	period of slow accumulation; succession of floors of House 6 at top
21,22	slow accumulation of structural collapse
23,24	moderate to rapid deposition of structural and domestic debris
25,26	non-structural debris
27,28,29	episodes of occupation and firing of grass
30	same
31	sterile floodplain alluvium

differences in adjacent areas. M2 is located 110 metres to the northeast of M1 (336 metres at 351° from Cement Marker 1); its Point of Origin (northeast corner) is 3.65 metres above Cement Marker 1.

Cultural deposits in M2 extended to a depth of five metres, within which eighteen excavated levels were recognized. The sequence of events resulting in the lower 3.5 metres of deposits in M2 appears to have been much simpler than in the lower levels of M1. On the other hand, the four houses recognized in the upper deposits at M2 suggest a far more rapid and complex series of events than in the upper deposits of M1. The complexity of the deposits from 0.5 to 1.0 metres in M2 resulted in a less secure correlation between excavated levels and strata identified in section (Figures 7.3 and 7.4). A description and tentative interpretation of the M2 excavated levels is presented in Table 7.3

The correct chronological ordering of the levels within the top metre of M2 deposits is far from clear because of the confused stratigraphic situation. A tentative reconstruction of the sequence of depositional events is nevertheless attempted in Table 7.4.

Jarfield 1 (JF1)

This was the first pit opened at Jenne-jeno; it is situated at the southeastern periphery of the site in an area of numerous funerary urns and a heavy surface scatter of sherds and slag. Four urns and the corner of a circular hut of cylindrical mud bricks were exposed on the surface of the 3 by 3 metre area of JF1. The Point of Origin (northeast corner) was 3 metres south and 6 metres west of Cement Marker 1; the Point of Origin was 0.28 metres below the site datum.

We found a total of nine urns, four inhumations, and several large pottery concentrations before reaching sterile floodplain at approximately 1430 mm depth. Deposits were badly disturbed by pits dug for the inhumations and urns. The urns were apparently buried to the rim and capped with a lid or inverted pot which served as a marker. Over much of JF1, the changes in strata were not detected during excavation; most were slight variations on light loam debris carried to the periphery from occupation areas towards the centre of the settlement. Excavated levels were changed arbitrarily more often than not. As a result, there is only slight correspondence between excavated levels and strata recognized in section (Figures 7.5 and 7.6). Table 7.5 presents an interpretation and description of the JF1 excavated levels in presumed order of occurrence.

Jarfield 2 (JF2)

A fourth pit, labelled JF1, was sunk eighteen metres to the south of Cement Marker 1; the Point of Origin was 0.95 metres below site datum. Deposits in JF2 were uniform and homogeneous throughout; the soil was the same firm light clay seen in JF1. Potsherds were invariably small and worn, and no urns or other features were found. It is very probable that the area of JF2 is composed of debris, including soil and potsherds, which has eroded out from higher points on the site. Ceramics from JF2 were not included in the pottery analysis.

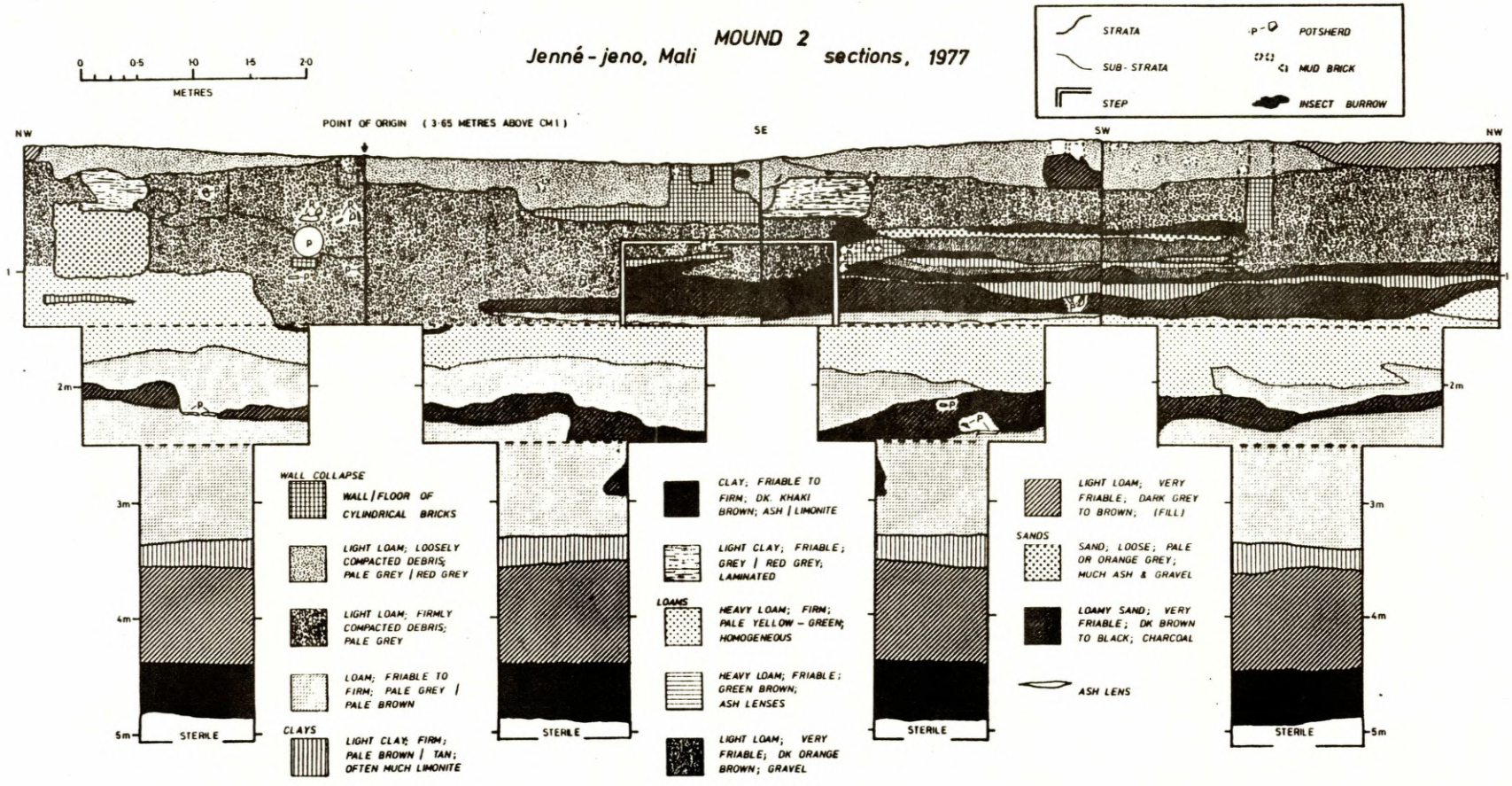


FIGURE 7·3 Sections: M2

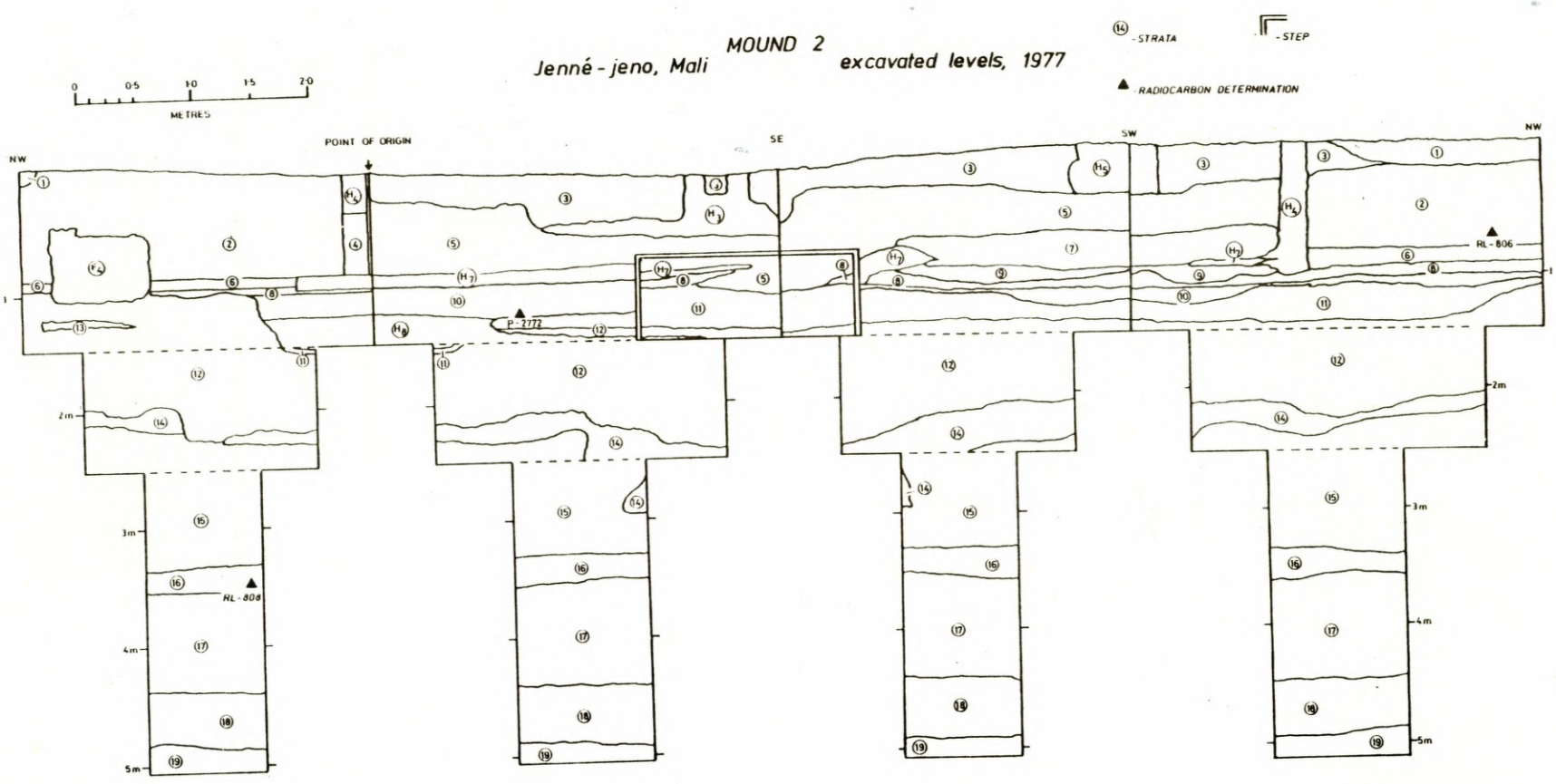


FIGURE 7·4 Excavated levels: M2

TABLE 7.3. Description of Excavated Levels in M2
(description of soil texture after Ahn 1970: 19-21)

Mound 2

Level 1: Rubbish tip dug into Level 2 to the exterior of House 3, with which it may or may not be contemporaneous. Dark grey-brown, friable light loam with much domestic refuse (charcoal, animal and human bone and fragments of cylindrical bricks).

Level 2: The interpretation of this level was difficult. It appears likely that the upper portions of the round House 4 were purposefully razed to a height of approximately 90 centimetres and the collapse material intentionally deposited inside (and partially outside) the House to protect an anthropomorphic terracotta statuette and associated pottery. The base of the statuette rests on the presumed floor of House 4 at 875 mm depth. This level is remarkably free of animal bone and other artifacts. We now suspect that the top of this excavated level comprised the collapse of the later House 3, but this was not observed during excavation. Pale grey to grey-brown, homogeneous, extremely hard light loam or loam. Radiocarbon date for charcoal collected from very bottom of Level 2: a.d.1120±140 (uncorrected).

Level 3: Mud wall collapse material from House 3--inside and outside (south) of the wall stump of that house. Tan, loosely compacted bricks and mud wall material of light loam.

House 3: Rectangular structure of cylindrical bricks of light loam built above the wall collapse of House 4. This too is difficult to interpret; the top course of House 4 appears remarkably undisturbed and there are few signs of occupation of House 3. House 3 may not have been a house at all, but rather a (ritual ?) perimeter built over the statuette within Level 2 and around Jar 10 resting above it.

House 4: Circular house of cylindrical bricks disturbed by House 3 and within which the statuette was found. Estimated diameter of the house is 4.25 metres. Bricks of grey light loam.

House 5: Round house of double layer of cylindrical bricks; estimated diameter 3.1 metres. Only exposed in the southwest corner; consequently, not enough pottery was recovered for inclusion in the pottery analysis. Bricks made of light-grey light loam from the floodplain.

Level 5: Mud wall debris deposited rapidly in the interior (east and south) of House 4. This probably is a continuation of Level 3 to the exterior of the house, but in its lower parts may include debris from House 7.

Level 6: This is an extension of Level 2 below the statuette (875 mm) within House 4. This may be the floor of House 4, but its texture differs little from that of Level 2 and no animal bone or artifacts were found (unusual for a living surface). Pale-grey, compacted loam.

Level 7: Series of thin lenses to the exterior (south and southwest) of House 7. This may represent a domestic tip, or, equally likely, one or more destructive events which led to the abandonment of House 7. The lowest lens (hard clay) may be the exterior of House 7 when it was occupied. Alternating lenses of grey-brown soft sand or light loam with charcoal, light-coloured ashy light loam, or light-coloured and firm clays.

House 7: Curvilinear (?) wall of cylindrical bricks with possible floor of rubble and large rectangular mud bricks and possible older wall of an exterior partition or separate structure.

Level 8: Rapid deposition of remains of a burnt structure built sometime before House 7. Dark grey-brown, very soft loamy sand with much ash and charcoal.

Level 9: This represents slow accumulation of fine clay with ashy components at the end of deposition of Level 8. Orange-grey, somewhat hard light loam with some ash lenses and dispersed charcoal.

Level 10: Lens representing slow erosion from mud-wall structures; in the northeast corner it grades into the rubble of so-called House 8. Light green-tinged, tan, hard, homogeneous clay with limonite nodules and charcoal. Radiocarbon date for charcoal from very bottom of Level 10: a.d.1030±150 (uncorrected).

House 8: Mislabeled feature which is probably a pit dug into Levels 11 and 12. Skeleton 13 was found at the very bottom immediately above a thin lens of charcoal. Light-coloured, very compacted rubble of loam.

Feature 4: Probable intrusion of tree roots into Level 2; extends very shallowly into the space of the pit. Pale grey-brown, very friable sand with many pieces of tree roots, none of which are charred.

Level 11: Domestic tip or debris from a house fire, with a possible hearth used at the latest period in the southwest corner (with several almost complete pots). Dark brown, ashy loamy sand with charcoal throughout, and ash lenses and patches of orange, fire-oxidized clay.

Level 12: Long period of accumulation of mud-wall debris. Pale green to pale brown, moderately hard heavy loam or loam--very homogeneous and much limonite.

Level 13: Related to the upper part of Level 12. Moderately dark brown, firm light clay, with much limonite.

Level 14: Evidence of destruction of a mud-wall structure by fire? Grey-brown, very ashy loam and sand with much charcoal and many large fragments of pottery.

Level 15: Slow to moderate deposition of wall-collapse material. Buff-brown, somewhat compacted loam, with little charcoal or limonite and few sherds.

Level 16: Possible floor and a lens of large sherds separates this from Level 15. Light-coloured, very hard and homogeneous clay. Radiocarbon date for charcoal taken from bottom of Level 16: a.d. 380± 110 (uncorrected).

Level 17: Structural debris and several discrete ash patches which may or may not be the remains of dispersed hearths. The ash patches are unlike those of the following level, however. Buff-brown and orange mottled sandy loam with many clods, ash, and charcoal patches; much domestic refuse.

Level 18: Khaki-brown with some orange mottles, soft to firm with increasing depth, heavy loam to clay with depth, several ash lenses reminiscent of those of the lowest levels of M1.

TABLE 7.4. Tentative Reconstruction of M2 Depositional Event Sequence
(related events enclosed by brackets)

Levels	Event
1	Late domestic fill in an excavated tip
Feat 4	Intrusive tree roots
3, Hs 3	Wall stump and collapse of square structure
5,2	Purposeful razing of House 4
6	Bottom of Level 2 or floor of House 4
Hs 4, 4	Round House
Hs 7, 7	Wall, floor, and collapse of House 7
9,8	rapid succession of building and destruction
10, Hs 8	Pit for Skeleton 13, debris on top
11	Fire destruction and/or rubbish tip
13,12	Slow accumulation
14	Destruction level?
15,16	accumulation
17	Structural debris and kitchen refuse
18	Episodes of occupation and grass firing

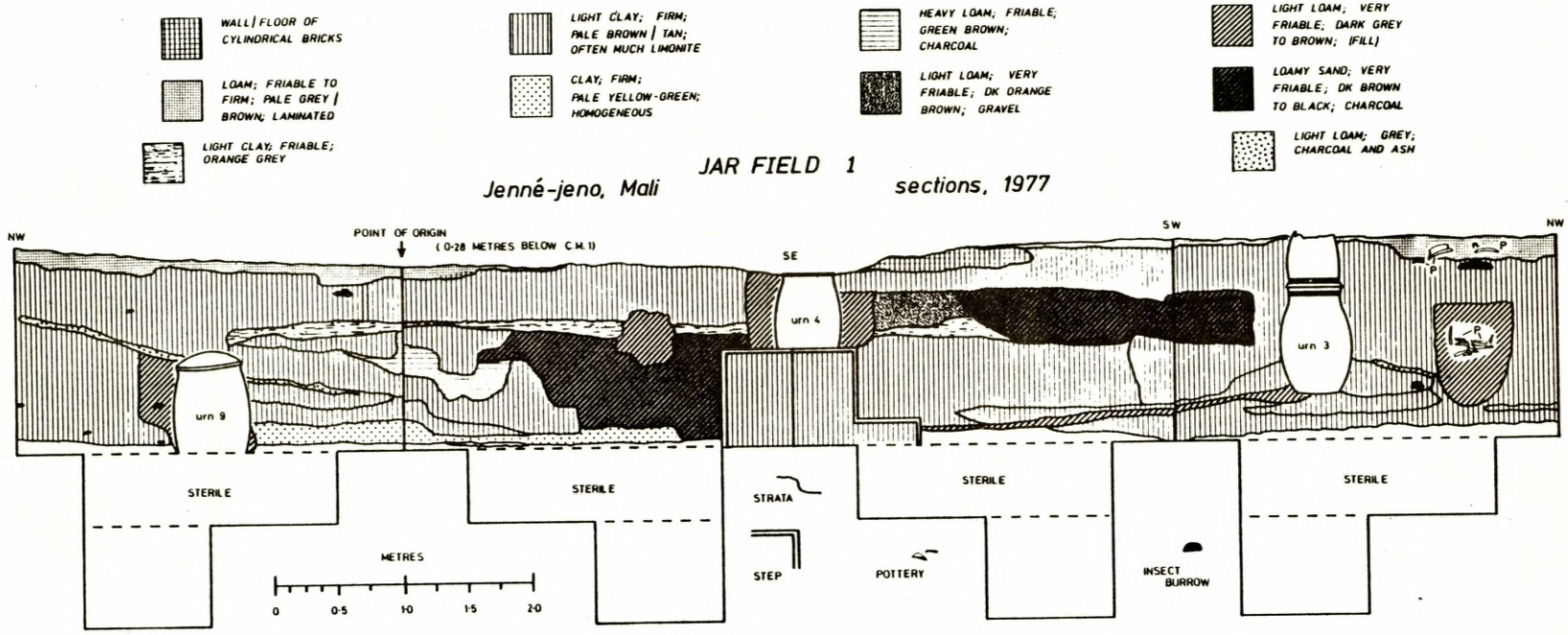


FIGURE 7·5 Sections: JF1

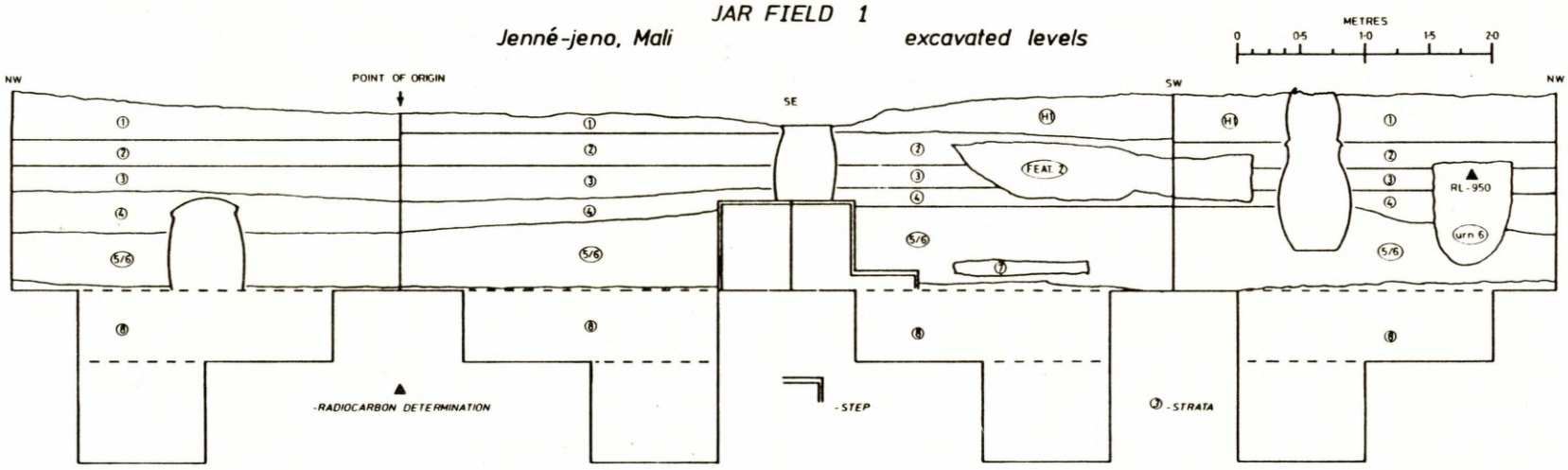


FIGURE 7·6 Excavated levels: JF1

TABLE 7.5. Description of Excavated Levels in JF1
(description of soil texture after Ahn 1970: 19-21)

Jarfield 1

Level 1: Wall collapse material from House 1 and more recent debris from upslope. All urns were probably in place before this level was laid down. Pale grey-brown, very hard rubble of loam or light clay.

House 1: Incomplete remains of hut or cylindrical bricks. Light-coloured loam and light loam debris and bricks.

Feature 2: Pit intrusive into Levels 2, 3, and 4 (apparently from the later period of Level 2). This was present only in the southwest corner of the pit and was bordered by a hard-pack layer on a WNW-ESE line--possible brick or rubble lining? Dark coloured loose sand with much charcoal.

Level 2: Slow accumulation of deposits from upslope area. Calcareous concretions at the discontinuity between this level and Level 1 and House 1 perhaps indicate the passage of some time. Pale tan-brown, firm light clay.

Level 3: Same as Level 2, but less compacted locally and slightly greater limonite content. Light tan-brown (with orange tinge) light clay.

Level 4: More of the same slow accumulation. Same texture and colour as Level 3.

Level 5: More slow secondary accumulation. The northern section (Figure 7.5.) suggests that this represents the very edge of the mound. Tan, very hard light clay.

Level 6: Slow accumulation of debris from higher parts of the mound when Jarfield 1 was perhaps the edge of the site. There may have been a pit feature through this level (beginning in Level 3) which was not recorded during excavation. For the purpose of analysis, this material was combined with that of virtually identical Level 5. Tan, extremely hard light clay; limonite is very concentrated throughout the level.

Level 7: Old root systems of a tree. Light coloured, friable sand with charcoal and root remains in a shallow lens from the southern wall.

Level 8: Sterile floodplain clay (light clay with much limonite).

Chronological Relationships between Excavation Units

Having reconstructed as nearly as is possibly at this time the sequences of depositional events in each of the excavation units, we now turn to the question of chronological relationships among the deposits in M1, M2, and JF1. This question is most readily answered with regard to M1 and M2, which were located 110 metres apart and exhibited several marked stratigraphic similarities. In certain cases, it was possible to state that similar levels in both pits had been created by the same depositional process or event. Three corresponding sets of levels were identified, based not only on the virtually identical texture and colour of the soil, but also on the presence of very similar relative frequencies of time-sensitive decorative attributes on the pottery from each pair of levels (the method of pottery seriation and its results are described fully in Chapter 9).

The lowest level (Level 30) in M1, for example, is almost identical to the lowest level (Level 18) of M2. Both consist of green/yellow heavy loams or clays interspersed with thin lenses of ash and containing large amounts of charcoal, limonite, and pottery. Additionally, M1 level 20 and M2 Level 15 are both composed of light-brown to buff compacted loams which appear to represent the same period of slow accumulation. The relative frequencies of time-sensitive attributes on the pottery taken from these two levels are virtually identical, which supports the claim that these two levels are contemporaneous. Another period of slow accumulation is attested somewhat later in time by Level 12 in M1 and Level 12 in M2, both of which are, again, composed of homogeneous, compacted, light-coloured loams. Once again, identical attribute percentages for pottery taken from the two levels argues for their contemporaneity.

These three pair of equivalent and contemporaneous levels, in addition to the series of eight radiocarbon dates obtained for M1 and M2, provide a firm framework for interpreting the chronological relationship of the two excavation units. This information is summed up graphically in Figure 7.7.

With reference to the M1 and M2 sequences, we have arbitrarily divided the deposits into four phases, based on the identification of discrete series of related stratigraphic events as well as on temporally significant changes in pottery (summarized in Figure 7.8) or other cultural characteristics. Phase I (comprising M1 Levels 30-25 and M2 Level 18) is defined by the absence of permanent mud architecture and the presence of finely-made, sand-tempered pottery. The earliest occupation phase began c. 250 B.C. and continued until c. A.D. 50. The upper chronological boundary for Phase I is provided by a radiocarbon date of a.d. 40 $\pm$ 50 obtained on charcoal taken from mud wall collapse in M1 Level 24. Phase II (M1 Levels 24-21 and M2 Level 17) is characterized by what appears to be structural collapse and dates from approximately A.D. 50-400. A period of slow accumulation in both M1 and M2 initiates Phase III (M1 Levels 20-13 and M2 Levels 16-14). This is followed in M1 by the lengthy occupation of House 6, which is ultimately destroyed at the end of the phase. M2 seems to have been relatively free of activity during much of the period of House 6 occupation. The large jump in relative frequencies of certain pottery attributes between Levels 15, 14, and 12 in M2 (cp. Figs. 37-38: App. II) suggests that the area of M2 was

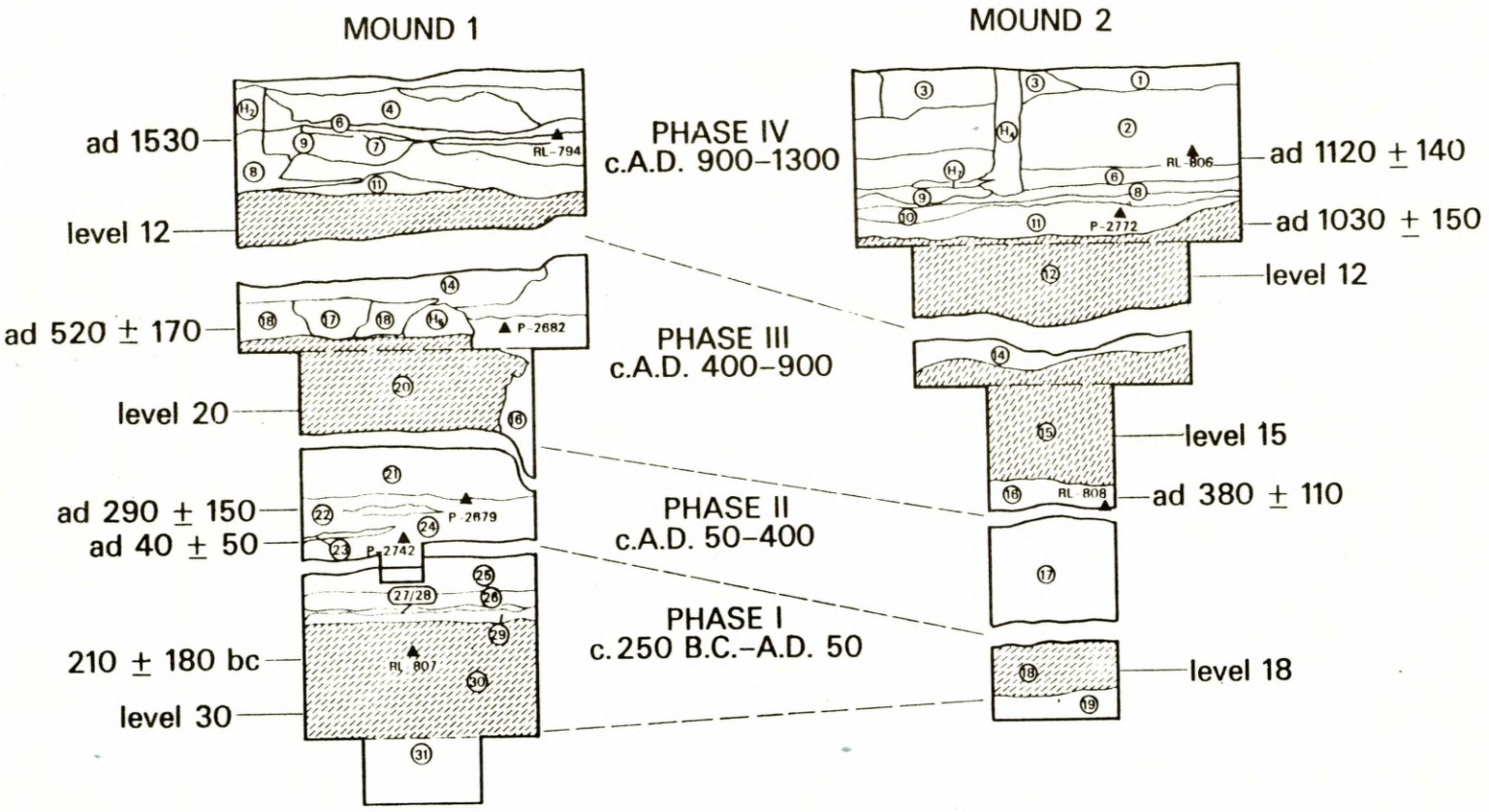
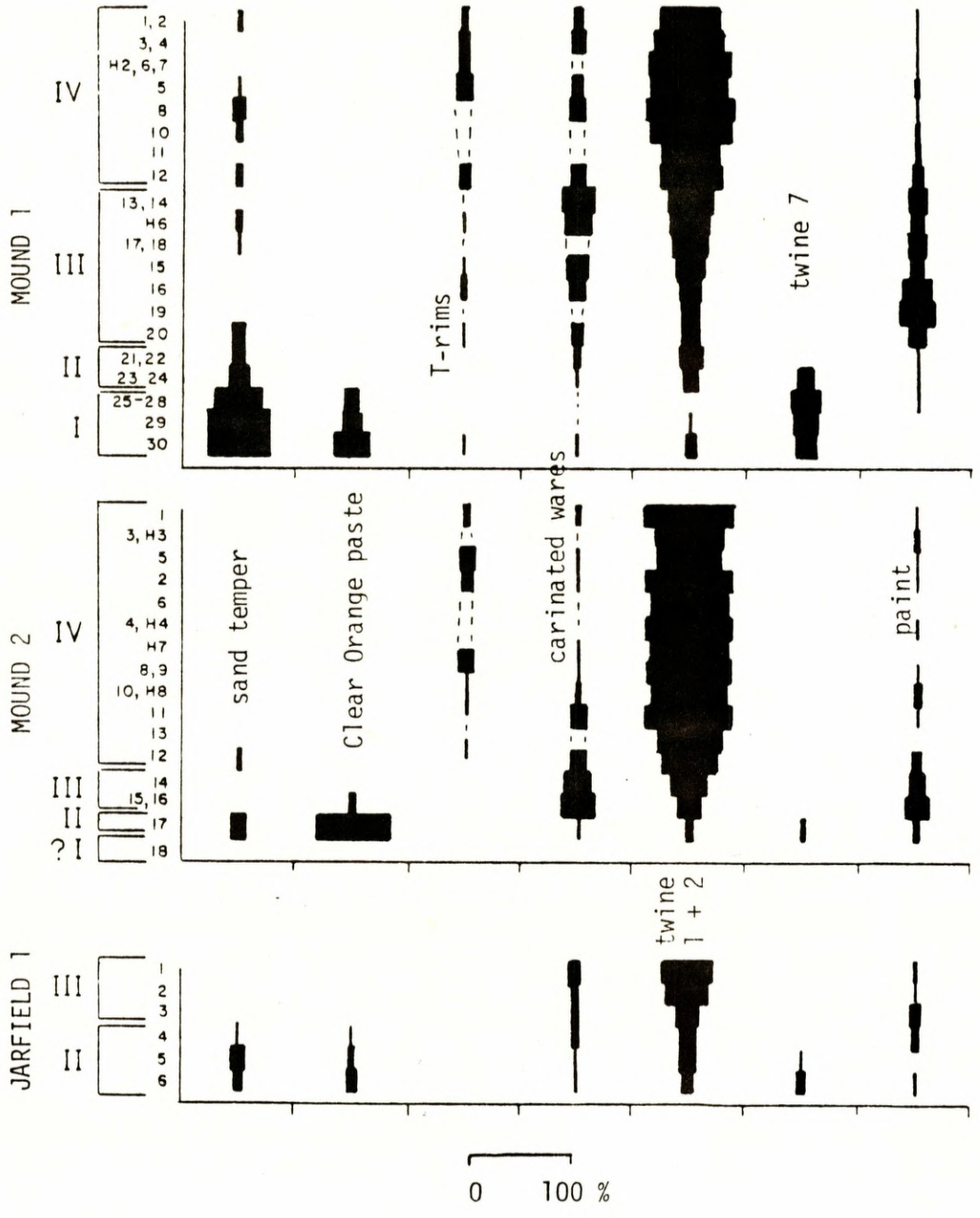


FIGURE 7.7 Chronological relationship of excavation units M1 and M2. Shaded levles represent deposits formed contemporaneously under similar or identical conditions (bench levels). Depths of radiocarbon samples are indicated by triangles; the uncalibrated dates are listed at the side.

FIGURE 7.8 Summary of changes in relative frequency of six temporally significant attributes of Jennejeno pottery (see Chapter 9 for details)



unoccupied and possibly undergoing active erosion at these times. The end of Phase III is very tentatively placed around A.D. 900. Another period of slow accumulation marks the beginning of the final phase of occupation identified at Jenne-jeno. Phase IV (M1 Levels 12-1 and M2 Levels 13-1) is subsequently represented in M1 by the building, occupation, and destruction of House 2, as well as by later accumulation. Phase IV in M2 includes an impressive amount of construction activity: Houses 7, 4, and 3 were all built and destroyed within a short period of time, possibly on the order of less than one hundred and fifty years after the end of the slow accumulation at the beginning of the phase. Inspection of the relative frequencies of pottery attributes indicates that the rubbish tip at the top of M2 was filled in at about the same time that House 2 was occupied in M1. It therefore appears that active deposition continued in the area of pit M1 long after it had ended at M2. This might well be interpreted as evidence for a slow and gradual abandonment of Jenne-jeno sometime prior to A.D. 1400.

The whole sequence of M1 and M2 events as reconstructed above is outlined in Table 7.6 below:

Table 7.6 Summary of the Chronological relationship of major depositional Events as Reconstructed for Mound 1 and Mound 2.

	MOUND 1	MOUND 2
A.D. 1400	abandonment	
	accumulation	
	destroyed	abandonment
	House 2 occupied	rubbish tip
	built	Houses 7, 4, 3, built, destroyed
	slow accumulation	slow accumulation
A.D. 900	destroyed	erosion?
		ashy Level 14
	House 6 occupied	erosion?
	built	
	slow accumulation	slow accumulation
A.D. 400		
	structural debris	structural debris
A.D. 50		
	occupation, no permanent architecture	occupation, no permanent architecture
250 B.C.	grass firing	grass firing

The place of JF1 deposits within this chronological scheme is more difficult to assess since the pit lies a maximum distance of four hundred metres from M1 and M2 and no stratigraphic similarities between it and the other two pits were noted. One radiocarbon date of a.d. 1130±180 was obtained on human bone from Funerary Jar 6; this date does fall within the expected chronological range of Phase III (A.D. 400-900) when two standard deviations are considered.

According to the pottery chronology developed and successfully applied to M1 and M2, JF1 deposits began to accumulate during Phase II. Over one metre of deposits (Levels 6-4) appear to have accumulated sometime between c. A.D. 50-400, based on the relative frequencies of attributes of the pottery taken from these levels. The remaining metre of JF1 deposits contained pottery characteristic of Phase III occupation. Phase IV pottery was not in evidence, although this does not necessarily mean that no deposits ever accumulated during Phase IV at JF1; it is important to recall that, lying in a downslope area, JF1 has been particularly subjected to erosion and deflation.

A summary of the assignation of excavated levels into the four occupation phases defined at Jenne-jeno is presented in Table 7.7

Table 7.7 Summary of the Excavated Levels Assigned to Each of Four Occupation Phases Defined at Jenne-jeno

	PHASE I	PHASE II	PHASE III	PHASE IV
MOUND 1	levels 30 - 25	levels 24 - 21	levels 20 - 13	levels 12 - 1
MOUND 2	level 18	level 17	levels 16 - 14	levels 13 - 1
JARFIELD 1		levels 6 - 4	levels 3 - 1	

CHAPTER 8

FEATURES, HOUSES, AND FUNERARY URNS

JARFIELD I (FJ1)

Surface through Level 1

As mentioned earlier, JF1 was sunk in the midst of a small concentration of funerary urns (alternatively referred to as jars) on the southeast periphery of Jenne-jeno. The density of surface features in the area of JF1 is illustrated in Figure 8.1; ten funerary urns and numerous segments of mud brick foundation were mapped within an area of forty-two square metres. Several mud bricks visible on the surface in the southwest corner of JF1 were designated House 1. It proved extremely difficult, however, to trace the foundation farther or even to outline the extent of wall collapse within the excavation unit. Almost the entire southern half of JF1 down to a depth of 250 mm was excavated as 'House 1 wall and wall collapse material', although this designation is, it must be admitted, little more than a 'best guess". Because very little pottery and no features of a domestic nature such as hearths were found within House 1 deposits, the function of this structure remains enigmatic. Although it is possible that the house was residential in function, a cemetery seems an unlikely place to live. More likely, the structure had a funerary or ritual function, but this cannot be proven.

Funerary Jars 3 and 4 were visible on the surface, but as they were actually embedded in the west section and the southeast corner, respectively, of JF1, it was not possible to excavate them. Plate I shows Jar 3 as it ultimately looked in section at the end of the excavation. Like most funerary urns, this one is covered by an inverted pot, although knobbed potlids are sometimes used as urn covers.

Funerary Jars 1 and 2 were also visible on the surface of JF1 and, upon excavating through Level 1 to a depth of 150 mm, it became apparent that they were associated in some way. Numerous fragments from the rim of Funerary Jar 1 lay at the same level as the large sherds of Funerary Jar 2, which was, in fact, not funerary at all since it contained no skeletal remains. Reconstructed, Jar 2 proved to be a carinated pot of the type often used for urn covers (Appendix II: Fig. 10). In view of its position at the same depth as the rim fragments of Funerary Jar 1, it is likely that Jar 2 once covered Jar 1. Funerary Jar 1 contained human remains in extremely poor condition. These and all other skeletal materials recovered from Jenne-jeno are described in Chapter 10.

Jar 5 was the final urn visible on the surface of JF1. It was covered by an inverted carinated pot (App. II: Fig. 13) and proved to contain skeletal remains in broken, disarticulated, and generally poor condition. In excavating

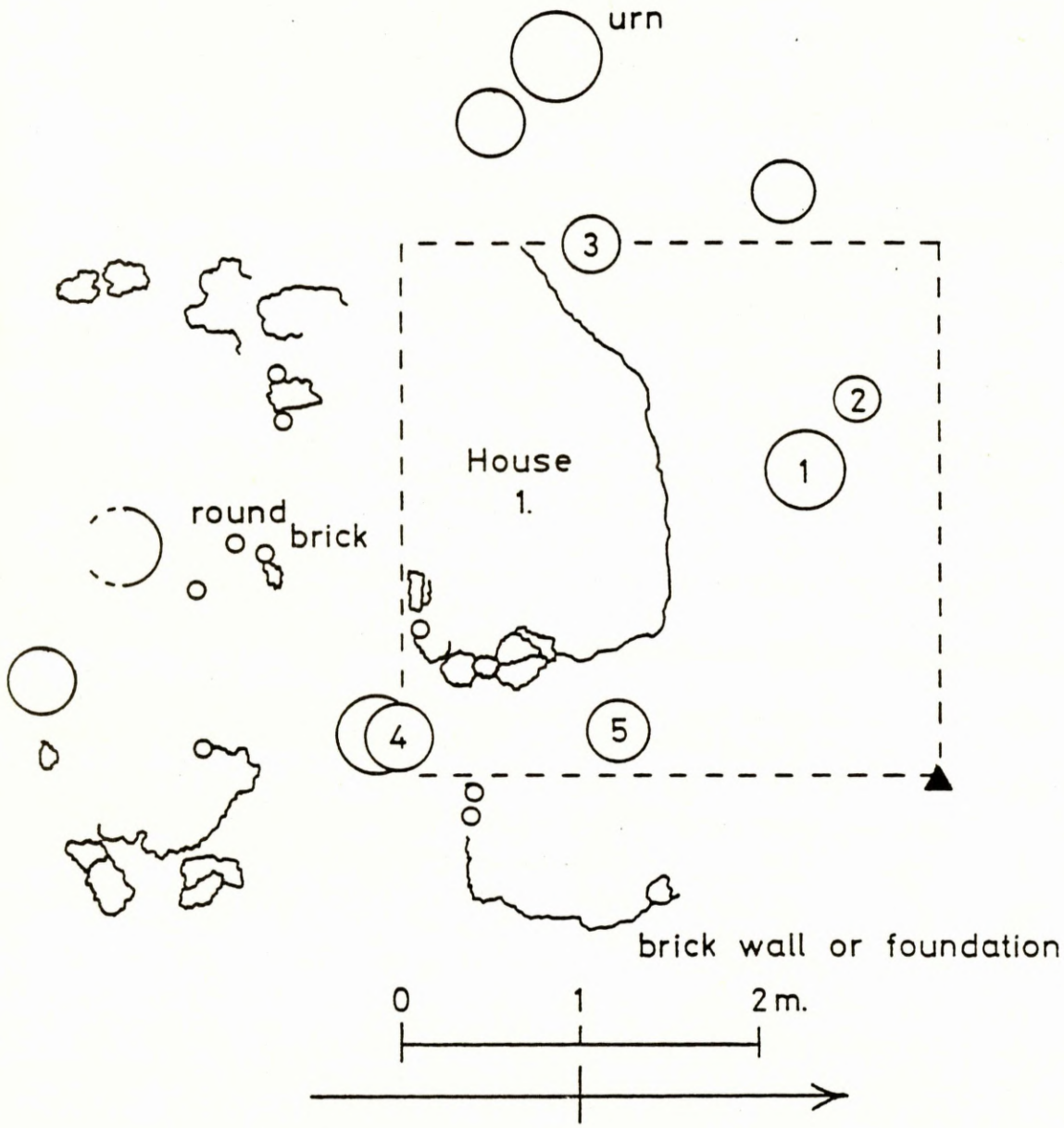


FIGURE 8.1 Surface features in the area of JF1.

Jar 5 (App. II; Fig. 23), the laminated nature of the soil in the urn was very striking; fine silts alternated with coarse sands in a manner suggesting aeolian deposition. It was only in the bottom 350 mm of the urn, in the area immediately surrounding the skeletal material, that deposits became more compact and homogeneous. This pattern indicates that the deceased was shoved into the bottom of the jar and just barely covered with earth; the urn was then covered by a lid or an inverted pot. Through time, wind-blown deposits settled into the urn through cracks and breaks that developed in the cover.

Levels 2 and 3

Three features appeared as we excavated through levels 2 and 3 to a depth of 450 mm. Skeleton 1 emerged immediately to the southeast of Funerary Jar 1 at a depth of 210-270 mm below the Point of Origin (northeast corner). The skeleton was completely disarticulated; it appeared that broken fragments of long bones had been gathered together and purposefully placed adjacent to Jar 1. The additional discovery of cranial and maxillary fragments to the north of Jar 1 at 230 mm depth reinforced our belief that the interment of Funerary Urn 1 disturbed an earlier inhumation, fragments of which were carefully gathered together and replaced in the fill around the urn.

Another disturbed burial was exposed in Level 2; at a depth of 350 mm on the east side of JF1, a new concentration of broken pottery appeared (Pottery Concentration 2 in Fig. 8.2). Among the fragments was a large piece of plate upon which rested several cranial fragments and a number of teeth. These remains were labelled Skeleton 2. Reconstruction of the pottery in Pottery Concentration 2 showed that parts of a potlid and a funerary urn, as well as the plate, were represented. It is probable that the urn burial of Skeleton 2 was disturbed by the later interment of Funerary Jar 5.

A third pottery concentration became visible at 230 mm depth. Further excavation revealed that the various broken pots in Pottery Concentration 3 were sitting atop another funerary urn (Jar 6). Included in the pottery concentration were three potlids and three carinated pots of the type commonly used as urn covers. In addition to these fragmentary pots, an intact carinated pot was inverted over Jar 6 (App. II: Fig. 12). The further excavation of Jar 6 proved most instructive. First, the urn contained a double burial. About midway through the urn deposits at a depth of c. 350 mm from the rim, a partially articulated skeleton (Skeleton 8) in good condition was uncovered in the southern half of the jar. Around and beneath Skeleton 8 were the completely disarticulated and severely disturbed bones of Skeleton 7, which was in poor condition. It is quite clear that Skeleton 8 was buried at least several years after Skeleton 7. A bone sample from Skeleton 8 gave an uncalibrated C14 date of a.d. 1130 $\pm$ 180.

Also of interest in the excavation of Funerary Jar 6 was the fact that the urn itself was touching the west section of JF1, providing an opportunity, upon the removal of Jar 6 from the pit, to study the nature and extent of the hole dug to accommodate the urn. Prior to this point, I had hypothesized that the potlids and inverted pots on top of funerary urns were left exposed

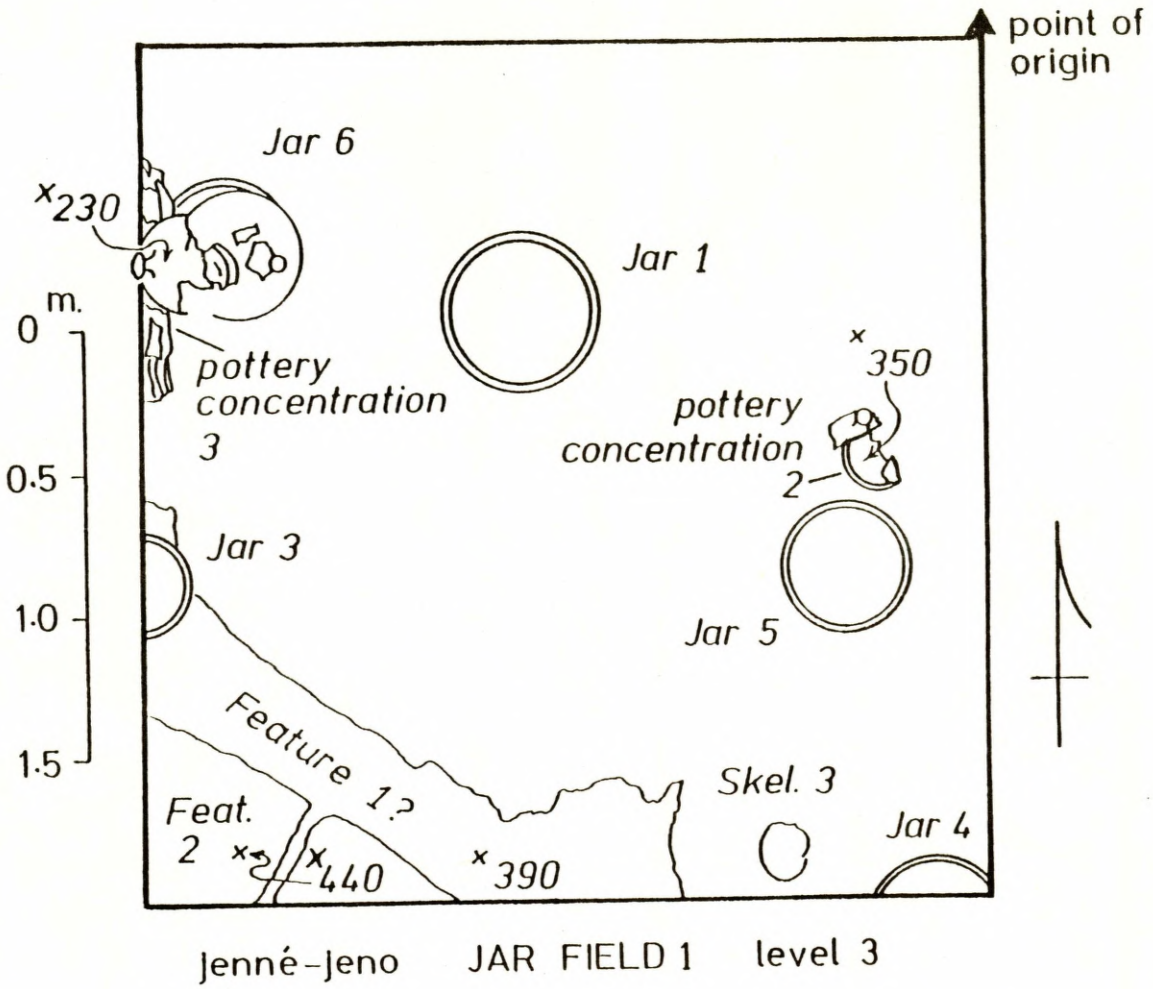


FIGURE 8.2 JF1 excavated through Level 3.

and functioned as grave markers. This seemed the most plausible explanation for the fact that so many urn covers were found askew and broken and also for the evidence of aeolian deposition in Jar 5 and other urns. This theory was substantiated by the discovery of a clear outline in the west section of the dark fill of the hole dug for Jar 6. Figure 8.3 shows the actual position of Jar 6 against the area of fill in section. It is clear that the surface of the ground at the time of Funerary Jar 6's interment was just a few centimetres above the rim of the urn, and that the inverted pot covering the urn was above ground. Without this kind of solid evidence for other urns, however, it is difficult to assume that covers were always left exposed, or if they were, to know how much of the cover was left above ground. This latter question is particularly relevant to urns covered by very deep pots, such as Jar 3 (cf., Plate I).

Other features of interest that appeared during the excavation of Levels 2 and 3 were: Feature 1, a line of hard-packed soil in the southwest corner of JF1 whose significance is unknown; and Feature 2, an area southwest of Feature 1 consisting of loose, sandy soil much blackened by ash and charcoal. Feature 2 is shallow in the southwest corner of JF1 but rapidly deepens as it continues into the south section of the pit, so the size and nature of this feature could not be assessed. In the southeast quadrant of the pit, the cranial vault of Skeleton 3 appeared at 440 mm depth.

Level 4

JF1 became increasingly crowded as Level 4 was excavated (Fig. 8.4). Additional urns as well as inhumations outside urns came to light as the excavations progressed. Skeleton 3, an east-west extended inhumation whose head appears to have been propped up against the side of the grave, was the first to appear. Tibiae, fibulae, and feet were missing, presumably because of disturbance by the later inhumation of Skeleton 5, a slightly flexed, northwest-southeast flexed burial in the southwest corner of the pit. Earlier than both Skeletons 3 and 5, however, was Skeleton 4, whose tightly flexed knees lay directly under the right femur of Skeleton 3. Skeleton 4 was positioned on its side, facing east, with hands cushioning the left cheek, Skeleton 5 was in a similar attitude, facing southwest.

Three more funerary urns appeared in rapid succession: Jars 7, 8, and 9 emerged at depths of 630, 630, and 660 mm respectively. The uppermost deposits in urn 7 were laminated, with sands and silts alternating. This phenomenon, probably the result of wind deposttion, has already been noted with regard to Jar 5. At 160 mm depth in urn 7, deposits became hard and homogeneous. A concentration of broken pottery, reconstructed into a "bottle" (App. II: Fig. 15) and a carinated pot (App. II: Fig. 13), was encountered just below this depth. This was the first urn to contain grave goods. Skeleton 10, in poor condition, lay in the bottom 300 mm.

Jar 8 was covered by a carinated pot (App. II: Fig. 13) and contained an almost completely articulated skeleton (Skeleton 11) in excellent condition.

Jar 9, capped by a broken lid, was left unexcavated as it was partially embedded in the north section of the pit.

No features were identified in Levels 5 or 6 of JF1.

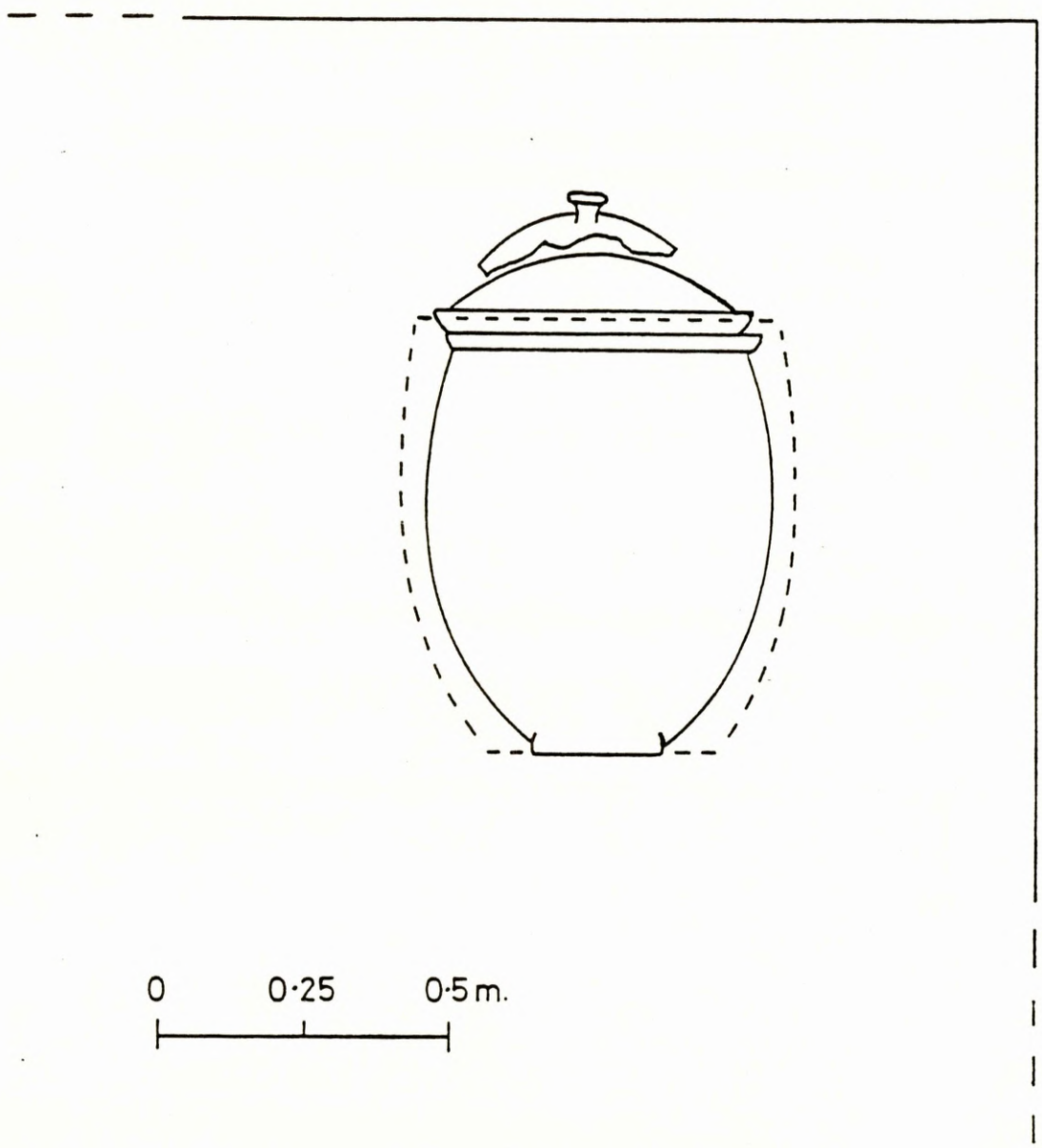


FIGURE 8.3 Funerary Jar #6 superimposed against area of fill visible in section.

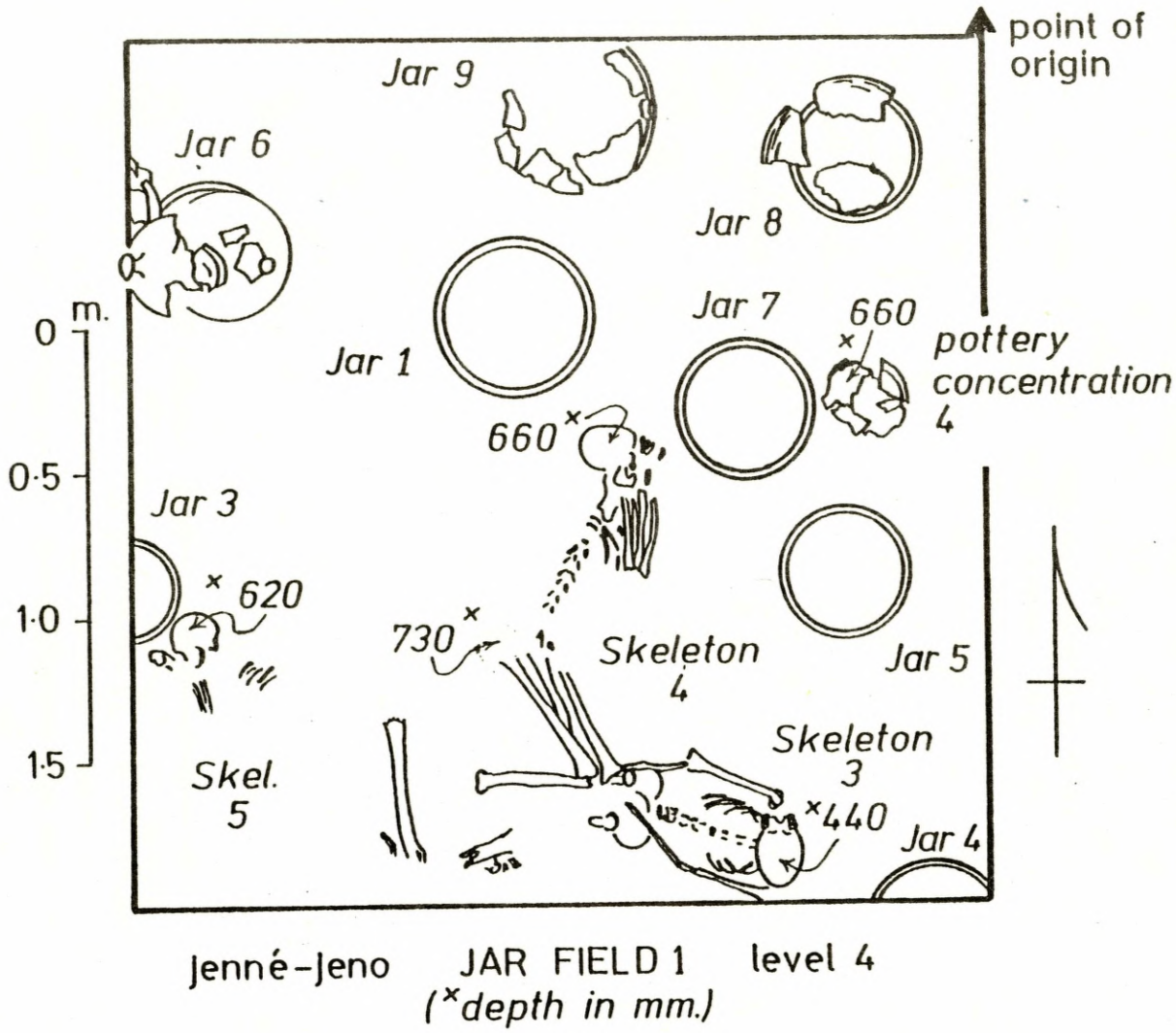


FIGURE 8.4 JF1 excavated through Level 4.

Sequence of events in JF1

If we may assume, given the evidence of Jar 6, that the top of the funerary urns bears a close relationship to the ground surface at the time of interment, then it is possible to reconstruct tentatively the sequence of burials in JF1. Jar 9 is the lowest urn and thus presumably the earliest. The ground surface at the time of its interment would probably have been c. 700 mm below the Point of Origin on the present surface. If this is so, Jar 9 was buried in the later part of Phase II, according to the potsherds recovered from the deposits at that depth. Jars 8 and 7 also appear to be late Phase II burials.

The remaining inhumations and urn burials seem to date to Phase III. Moving from early to late, the reconstructed order of urn burials is Jars 6, 5, 3, 1 (and 2), and 4. Furthermore, since the interment of Jar 5 was the probable cause of the disturbance of Pottery Concentration 2 (originally an urn burial containing Skeleton 2), the burial of Jar 5 must postdate the interment of Skeleton 2. Likewise, Skeleton 1 must have been inhumed sometime prior to Jar 1, which disturbed it.

The relative order of the inhumations outside urns can be reconstructed as Skeletons 4, 3, and 5 (earliest to latest). Because we have no evidence concerning the depth of the holes dug for each inhumation, however, we cannot discuss the order of inhumations with respect to urn burials. We can only state that all inhumations were probably Phase III events because they cut so shallowly into Phase II deposits (Level 4). Table 8.1 summarizes these conclusions:

Table 8.1 Reconstructed sequence of burials in JF1

	PHASE II	PHASE III
	Jars	Jars
Urn burial	9, 8, 7	6, (Pottery Conc. 2?), 5, 3, 1+2, 4
		Skeletons
Inhumations		4, 3, 5, (1?) - placement relative to urn burials unknown

MOUND 1 (M1)

House 2

We encountered the wall and wall collapse material of House 2 at a depth of 290-320 mm (underlying Level 4). The orientation and extent of the wall stump are illustrated in Figure 8.5 Constructed of cylindrical mud brick, the wall extended diagonally across M1 from southeast to northwest. To both sides of the wall were areas of wall collapse, within which toppled and disoriented cylindrical bricks could be clearly seen. A lens of this wall collapse material (= Level 6) to the northeast of House 2 is prominent in the north section of M1 (Plate II).

House 6

The curvilinear coursed mud (or tauf) wall of House 6 appeared at a depth of 1520-1580 mm. Extrapolating from the excavated segment of the wall,

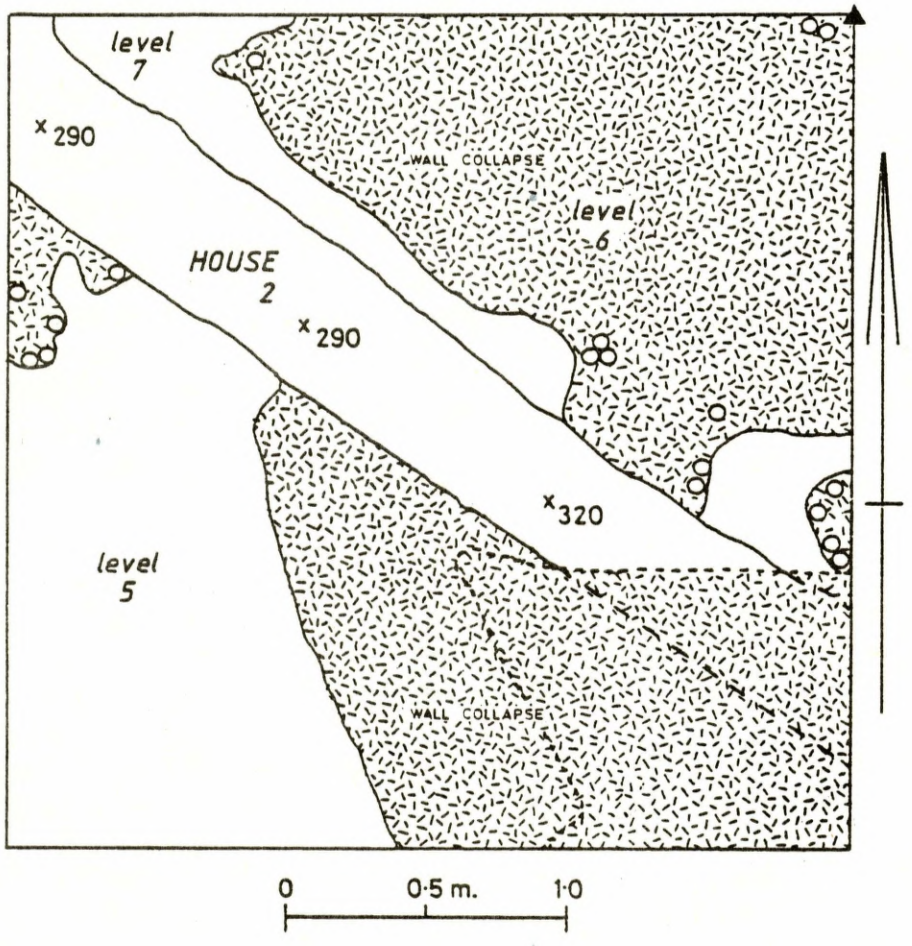


FIGURE 8.5 House 2 wall and wall collapse in M1

external house diameter would have benn between 6 and 6.5 metres. The absence of compacted wall collapse debris around the tauf wall indicates that the superstructure may have been constructed of organic materials such as reed or grass. Sometime after the original construction of the tauf foundation of House 6, an exterior partition, also of tauf, was added to the north (Plate III). This was identified by our workmen as part of a bathing area on the basis of its position relative to the house and the characteristic green tinge of the soil inside the enclosure (i.e., west of the partition—Level 18). East of partition was a rubbish pit (Level 16).

Near the top of the rubbish pit at a depth of 1900 mm was a covered carinated pot (App. II: Fig. 8) containing the remains of an infant aged 16-24 months. This pot (Jar 12) can be seen in Plate III although it is partially obscured by the exterior tauf partition, which directly overlay it. A charcoal sample taken from the area immediately northeast of the rim of this pot yielded an uncalibrated radiocarbon date of a.d. 520 $\pm$ 170, which provides an approximate date for the deposition of Jar 12. It also serves as a terminus post quem for the construction of the exterior partition ot House 6. As indicated in Chapter 7, House 6 was apparently inhabited without interruption for a considerable period of time, as evidenced by numerous house floors and a substantial depth of domestic deposits.

No other houses or specific features were identified in M1.

MOUND 2 (M2)

Surface to 500 mm

The surface features that initially induced us to begin excavating at M2 are illustrated in Figure 8.6. They include part of a rectilinear house constructed of irregular cylindrical brick (House 3), a curvilinear wall of irregular cylindrical brick (House 4), a curvilinear wall of very regular cylindrical brick House 5), and a large, globular pot with an unusual black painted design (Jar 10—described more fully in Chapter 9 under Special Pottery Finds). Since only a few centimetres of the wall of House 5 were situated within the excavation unit, little more can be said about it here, other than that it appears to have been the most recently constructed of the three houses (cf. Fig. 7.4) and that the exterior diameter of House 5 was approximately three metres.

The excavation of Houses 3 and 4 was extremely difficult; not only was the soil highly compacted throughout the upper M2 deposits, but it was almost completely homogeneous in colour and texture. Although the wall of House 4 passed into the west section of M2, the mud brick wall was scarcely visible against the other pale-grey, clay-rich deposits. We felt that this homogeneity could best be accounted for by interpreting all these upper deposits (Levels 2, 3, 5—see Fig. 7.4) as wall collapse material. Visually, the deposits offered nothing to substantiate this belief; toppled mud bricks could not be identified on sight in the deposits. Rather, it was the feel of the soil under the hoe, coming out in clods about the size of mud bricks, that suggested this interpretation. Exposure of the M2 sections to the violent early summer rains during June ultimately proved the validity of this interpretation; erosion etched away the softer matrix from the mud brick of the wall collapse. Without the benefit of erosion while excavating, however, it was very difficult to

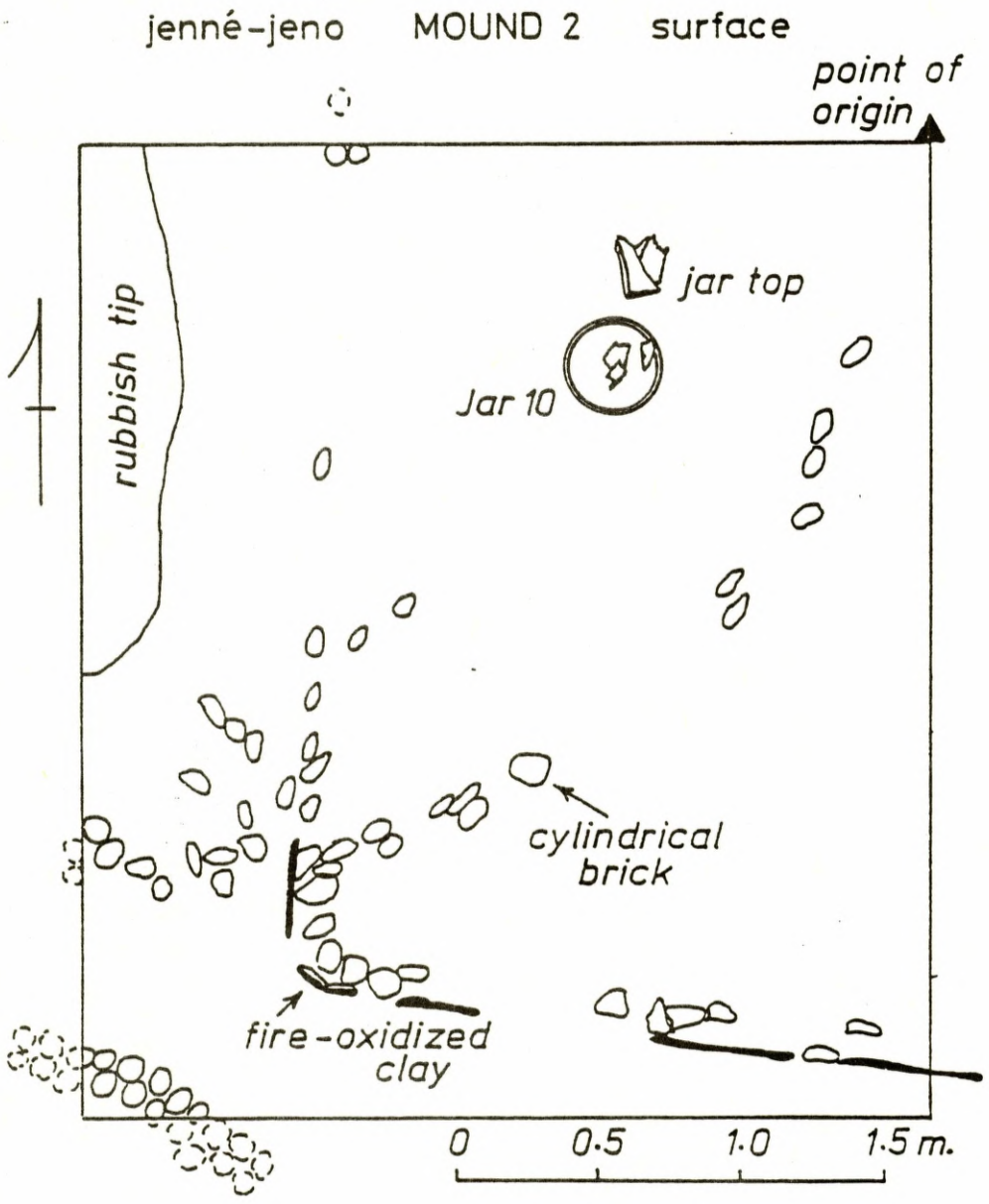


FIGURE 8.6 M2 surface features

samples of non-rim sherds may decrease, in some unknown fashion, the precision of results of body sherd analysis. Clearly, the most reliable method of taking a 50% random sample of sherds would be to number each sherd in the bags from a given level and select exactly one-half of them with the aid of a random number table. The shuffle-and-divide method described earlier obviously does not allow the selection of exactly 50% of the sherds in each stratum. At every dividing point, each pile of sherds was partitioned into two piles of approximately the same size (i.e., volume). Although hand mixing of piles was conscientiously practiced before each pile division to ensure an equal distribution of large and small sherds throughout the pile, the presence of a few quite large sherds could easily make two piles containing substantially different numbers of sherds appear almost equal in volume. Because this situation occurred in relatively few bags, any hidden sample bias resulting from it will not affect the entire sample in a consistent fashion. This problem would most seriously affect the validity of any inferences made concerning the quantity of non-rim sherds present in the original population of sherds of each stratigraphic level. Under such a sampling scheme, for example, it would be unwise to presume that a "50% random sample" of 50 sherds had been drawn from a total population of 100 sherds. Calculations of attribute percentage frequencies, on the other hand, should not be seriously affected by the sampling scheme described, and much of the pottery description is presented in this manner.

Every effort was made to insure that every bag of non-rim sherds was sampled in a consistent fashion. It is possible that we erred on the side of too much consistency; a 50% sample of sherds was taken even from levels with a small number of body sherds. The smaller the number of sherds, the higher the probability that sherds with rare but significant attributes will be either missing or over-represented in the sample. In cases where the number of body sherds in a level was less than 100, it probably would have been wiser to record all the sherds. Tables of total sherds, rim sherds and body sherds recorded per level in each test pit are provided(see Appendix II) so that the reader may decide which levels are most likely to be affected by this problem. Although the problem of small numbers of sherds was not compounded for rim sherds by sampling, nevertheless the increased risk of skewed attribute frequencies as a result of small sherd totals is equally real for rim-sherds.

In addition to sampling considerations, the method of recording pottery data can have a profound effect on the accuracy and completeness of the description which can be produced from the data. One instance in particular requires mention. Although a large number of variables were recorded for each sherd, the importance of noting the position of decorative attributes, rather than mere presence or absence, was not recognized until after leaving the field. This has particular consequences for the analyses of attribute association which were undertaken. It is fairly clear, for example, that the Jenne-jeno potters decorated the rims of certain classes of vessels (e.g., carinated bowls) quite differently than the bodies. In describing a rim sherd large enough to include part of the body of the vessel, however, the presence, but not the position, of decorative attributes was noted. Thus, for one sherd, several attributes were recorded, some of which occured either only on the

rim (e.g., above the carination) or only on the body, but there is now no way of knowing which attributes were restricted to certain parts of the vessel. This shortcoming in recording has limited our ability to fully describe the pottery from Jenne-jeno.

Keeping the points discussed above in mind, we can now turn to the description itself.

Definition of Pottery Variables

Non-formal variables.

Provenience. Provenience was denoted by means of the excavation unit number and the number of the level from which a sherd was recovered.

Non-decorative formal variables.

Paste. Paste refers to that combination of clay and non-plastic inclusions which together constitute the fabric of a piece of fired clay. Following the usage of Shepard (1954: 25) those classes of non-plastic inclusions which were deliberately added to the clay (e.g., crushed pottery) are called temper, and those whose presence cannot definitely be attributed to human manipulation are simply called non-plastic inclusions. Paste was identified in terms of the type of non-plastic inclusions which characterized it as well as in terms of its texture. Those two aspects of paste are inseparable, since paste texture is primarily influenced by the amount, grain size, and shape of its non-plastic inclusions (Shepard 1954: 117).

Two kinds of non-plastic inclusions were recognized: grog (crushed potsherd) temper and sand. It is not known whether sand occurred naturally in some of the clay sources utilized by the Jenne-jeno potters or whether it was deliberately added. As one might expect in an alluvial area where water moves at variable rates of speed during the year, the sand in the paste is variable in size, ranging from 1/4 mm in diameter up to water-rolled pebbles approaching 5 mm diameter.

On the basis of visual inspection with a hand lens, the paste texture of each potsherd was classified as coarse, medium or fine. Coarse texture is described, using Wentworth's size classification for sediments (reproduced in Shepard 1954: 118), as having a large amount of grog temper whose diameters range from 1.5 to 4.0 mm (very coarse and granule size on the Wentworth scale). Medium texture has large amounts of inclusions (usually grog, but sometimes sand) ranging from 1/2 to 2 mm in diameter (medium to coarse on the Wentworth scale). Both coarse and medium textured sherds are frequently characterized by the presence of infrequent water-rolled quartz pebbles, measuring up to 5 mm in diameter. This latter feature indicates that little if any care was taken by the potters to remove coarse particles in order to increase the homogeneity of the clay. A cursory hand sort of the clay may have been undertaken, but sifting surely was not. Fine texture sherds, on the other hand, normally had no inclusions greater than 1 mm in diameter. The actual number of inclusions in fine paste is small, and the majority of them are less than 1/2 mm in diameter.

Clearly, the actual values for paste texture form a continuum, and the methods of visual inspection used to judge texture provided only a gross categorization of this variable.

Colour. Like paste texture, paste colour was judged by visual inspection of a fresh break. Because efforts to procure a Munsell colour chart prior to leaving for Africa were unsuccessful, the definition of the various colour categories used could not be formally standardized in the field. Upon returning from the field, however, sherds in the study collection brought to the U.S. were visually categorized by colour in precisely the same manner accomplished during recording. The following table presents the range of Munsell values for study collection sherds within each colour class recognized in the field:

Field Colour Categories	Munsell Colour Categories
Dark Orange	2.5 YR 5/6, 5 YR 5/8
Light Orange	5 YR 6/6, 5 YR 7/6
Buff	10 YR 8/4, 10 YR 7/3
Black	2.5 Y 2/0, 5 Y 3/1, 5 Y 2.5/1
Clear Orange	7.5 YR 7/6,7 7.5 YR 6/6
Grey	2.5 Y 5/0,2 2.5 Y 4/0, 10 YR 4/0
Bright Orange/Rose	10 R 6/8, 10 R 5/8

The presence or absence of uneven colour (such as mottled patches of grey or black) due to local reduction during firing was also noted, as was the presence or absence of a grey core. Both these phenomena directly reflect firing conditions. Surface blackening, consisting of an accumulation of carbon due to direct contact with fire, was a fourth colour variable recorded for each sherd.

Position. The original position of a sherd on a pot was designated as rim, body, handle, or base. Special features of body sherds, such as carinations, were noted, and base sherds were described according to their form (flat, ring, or polypod).

All rim sherds were described in terms of their shape in radial section (i.e., rim profile). Over 30 different rim profiles were recognized at Jenne-jeno, and each was drawn and numbered so that similar rims could be described by means of a number. For several of the rim profiles, examples of whole pots were recovered. Vessel shape for most rims is conjectural, however, and has been reconstructed on the basis of rim angle whenever the original placement of the rim could be ascertained. Identification of rim angle permits various rim profiles to be grouped into larger classes. Two major categories of rim shape (vessel shape) may be defined following Shepard (1954: 230-1): Unrestricted—those vessels for which a tangent drawn to the rim in profile is vertical or inclined outward, and for which there is no point on the vessel contour marked by a constriction; Restricted—a tangent drawn to the rim in profile inclines inward or there is a point in the vessel contour marked by a constriction.

These two major categories can be supplemented by other classifications for the purposes of describing the Jenne-jeno assemblage as follows:

Unrestricted	Restricted
Simple	Simple
Non-vessels (potlids)	Carinated forms
Everted Rim	T-rimmed
Thickened Rim	Bottles
	Everted rim
	Thickened rim
	Slightly everted rim

The various rim profiles identified at Jenne-jeno have been grouped according to this classification system and are illustrated, with vessel shape reconstruction when possible, in Appendix II. Figure 9.1 (a, b, c) presents a graphic summary of the major classes of rim profiles identified for Jenne-jeno pottery.

Diameter. If the arc on a rim sherd was sufficiently large to permit determination of the diameter of the pot lip, this was attempted. The lip surface of a rim sherd was placed in contact with a flat piece of paper on which arcs of circles of various diameters had been drawn with a compass. After ensuring that the entire lip edge was flush with the paper, the sherd was moved onto the various drawn arcs to determine which provided the closest fit to the arc of the lip. The diameter of the circle described by that arc was then recorded as the diameter of the pot at the lip.

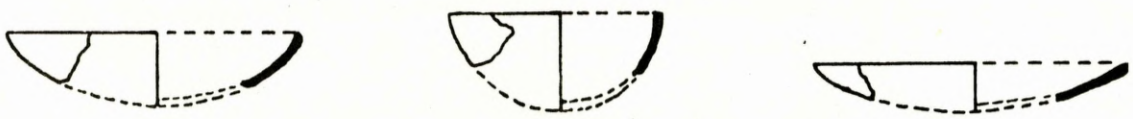
Thickness. Thickness was measured with sliding calipers. Rim sherds were measured at the point farthest from the lip, since the lip was often deliberately tapered. This choice of measurement proved problematic only for rim sherds from carinated pots which had broken at the carination. Because the angle of carination is often the thickest point in the pot wall, measurements taken at that point cannot be used to represent body wall thickness for the original pot.

To ensure consistency, body sherds and base sherds were always measured at the thinnest point.

Information on mean sherd thickness and standard deviation for major rim classes is provided in Appendix II (Table G).

Surface Treatment (presence or absence of slip). Slipping is included here as a non-decorative variable despite the fact that on certain classes of pottery it is applied to a restricted area on the exterior surface of the pot (i.e., the rim), where other decorative techniques are also focussed. In these cases, slipping appears to be part of a decorative package which included grooving and painting. However, slipping may also serve a functional purpose, since it "renders pottery less permeable, particularly when well polished" (Shepard 1954: 191). The inclusion of slipping in the class of non-decorative variables is to a certain degree arbitrary, but the usage here follows Shepard (1954), who does not include it with decorative techniques.

The presence of slipping was easily recognizable by its colour contrast with the paste. Slipping on exterior surfaces was recorded separately from treatment of the interior surface of sherd. The most common colour of slip was dark red/orange, described by Munsell values 10 R 4/6, 10 R 5/6, 10 R



UNRESTRICTED SIMPLE RIM

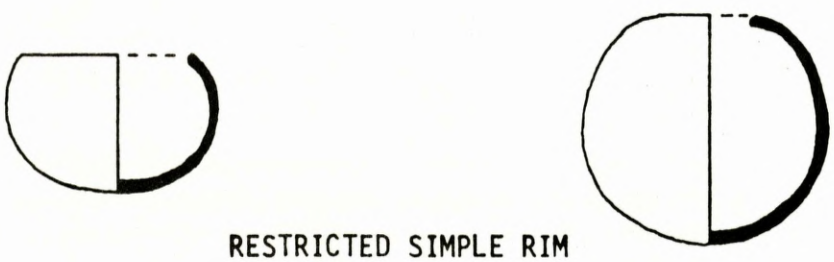


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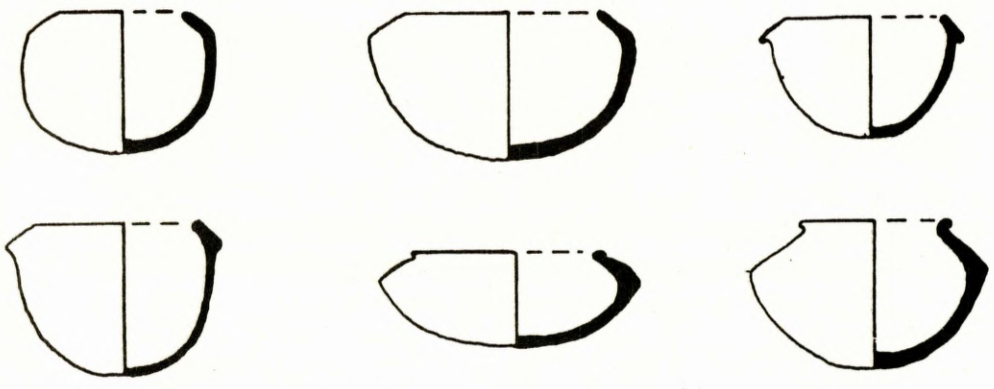
UNRESTRICTED EVERTED RIM

UNRESTRICTED THICKENED RIM

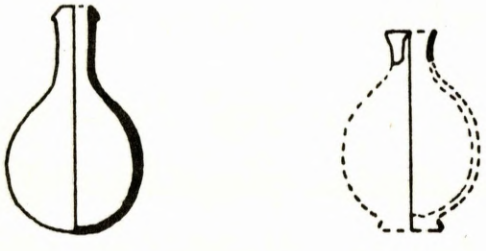


RESTRICTED SIMPLE RIM

Figure 9.1a Summary of the major classes of rim profiles identified for Jenne-jeno pottery. (Not to scale)



RESTRICTED CARINATED RIM



BOTTLES



RESTRICTED T-RIM AND VARIANT

Figure 9.1b Summary of the major classes of rim profiles identified for Jenne-jeno pottery (Not to scale)

The steps required for this kind of investigation, given an assemblage, include selection of some class of artifacts as the subject of study, selection of attributes with which to work, organization of these attributes into sets of mutually exclusive attributes, listing in some form all possible attribute combinations resulting from the intersection of the dimensions recognized, counting the number of artifacts exhibiting each of the attribute combinations, and finally subjecting the resulting frequency distribution to statistical association analysis.

The class of artifacts under study is pottery (specifically, rim sherds); the selection of attributes as well as their organization into sets (called variables) was accomplished during the recording of potsherd data. The listing of all possible attribute combinations is probably most efficiently achieved by use of a row-by-column table. But here we encounter the vexing fact that for each set of two mutually exclusive attributes added to the list of recorded variables, the number of cells in the row-by-column table of all possible attribute combinations is increased by a power of two. Thus, the possible combinations of the attributes black and white, long and short equals four, but the additional consideration of sand and grog temper increases the number of possible combinations to eight. Were it my intention to produce a row-by-column table for all possible combinations of two attributes recorded for each of the thirteen formal dimensions discriminated for the Jenne-jeno pottery, the resulting table would have 2^{13} or 8192 cells. By further considering non-formal variables such as provenience, the cell total would be increased to 401,408 (seventeen 8192-cell tables are required for the seventeen levels of M2, and thirty tables for the thirty levels of M1). Even if only 0.1% of the total possible attribute combinations were actually observed, a 400-cell table would be required to accomodate the data. In most cases, several thousand observations are necessary to render such a table even remotely meaningful.

The options for reducing the number of cells in a frequency table are two: reduce the number of variables under consideration, or reduce the number of attributes under study by collapsing several values into one. Both options can potentially result in a loss of important information. An obvious example easily illustrates the risks of collapsing data: fifty pottery observations are recorded from Pit 1, level 1; twenty-five of these are small, slipped pots, twenty-five are large, unslipped pots. This information can be presented efficiently in a four-cell frequency table (a). From Pit 2, level 1, twenty-five small, unslipped pots were found along with twenty-five large, slipped pots (b).

(a)

	slipped	unslipped
small	25	0
large	0	25

(b)

	slipped	unslipped
small	0	25
large	25	0

Although the two four-cell tables strongly suggest that the four formal attributes considered are associated with respect to different areas of the site in a highly significant manner, this information is lost as soon as we collapse these two tables into one table of pots from level 1 (c).

		slipped	unslipped
(c)	small	25	25
	large	25	25

Similarly, important information on potting behaviour might be lost through a decision to omit from consideration what is in fact a highly significant variable. Intuition is the archaeologist's major weapon in combatting this problem: after months of gazing at a pottery assemblage, recording data about it, and manipulating and tabulating the recorded data, the major behaviourally significant attributes of the assemblage can be recognized with some degree of confidence.

Both of the options discussed above were used in the Jenne-jeno analysis. It was decided, for example, to omit the continuous variables of rim diameter and sherd thickness, and also to pass over the variables of sherd colour, presence of grey core, and surface colour mottling, all of which might be determined by wind conditions during firing. Rather, those variables were selected for investigation whose patterned interaction might shed light on the basic potting rules observed by the potters at Jenne-jeno. Six discrete, formal variables were chosen: outer surface treatment, inner surface treatment, twine rouletting, paint decoration, plastic decoration, and rim shape. Because one of the questions of interest in this analysis was the determination of whether slipping treatment and mode of decoration varied systematically with rim shape, it was decided that an efficient and useful way of listing all possible combinations resulting from the intersection of these variables could be achieved as follows: the possible combinations of the first five variables chosen were displayed in a 32-cell (2^5) row-by-column table, and one 32-cell table was constructed for each of eleven major classss of rim shape. The number of observed combinations of the first five variables were then counted for each rim class and recorded in the appripriate cell on the appropriate 32-cell table. Thus, it is possible to determine instantly the number of potlids lacking slip on both surfaces and having only twine decoration by consulting Table 9.2 (p. 131), row 4, column 4.

The drawback to th e frequency tables is that a good deal of data collapsing was necessary to create them. First, the numerous attributes recognized for each variable had to be reduced to only two: presence-absence (i.e., a dichotomous situation). Because non-formal variable s (i.e. provenience) are not considered in these tables, the observations on any given rim class represent data from two test pits and many different levels collapsed into a single table. Similarily, the eleven major rim classes in most cases were created by combining several similar rim shapes out of the thirty-three rim shapes originally recognized and recorded. Parenthetically, it might be noted here that five of the originally recorded rim shapes are not included in any of the eleven major rim classes, due either to the unusual or infrequent nature of the rim (rims 8, 20, 26) or to the extreme smallness of the sherds, which precluded determination of the original rim angle (rims 12, 15). The total number of sherds in these five classes isforty-two, out of 2288 rims recorded from M1 and M2.

The frequency tables for each of the eleven major rim classes follow below; in parenthesis immediately after the major rim class name are the numbers of the originally recorded rim classes (33 in all) which have been grouped together to form the major rim class. Beneath each table is a written description of what in my opinion are salient patterns observable in the table for that rim class. Additional descriptive information not available in the frequency table is also presented, including the percentage of sherds within the rim class which exhibit fire blackening, the range of rim diameters observed, and data on burnishing. At the lower right-hand corner of each page, a list of Figures and Plates illustrating the rim class is provided.

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	2			2	4
+ twine, + paint, - plastic	1	11	1	1	14
+ twine, - paint, + plastic	6	2	10	15	33
+ twine, - paint, - plastic	27	54	37	152	270
- twine, + paint, + plastic	6	2	2	2	12
- twine, + paint, - plastic	2		1	1	4
- twine, - paint, + plastic	15	1	11	23	50
- twine, - paint, - plastic	57	17	42	109	225
	116	87	104	305	

TABLE 9.1

UNRESTRICTED SIMPLE RIM (1,27,29) N=612

Unrestricted simple rims come from wide-mouth vessels with diameters ranging from 10 centimeters to over 38 centimeters. Approximately one-half of all sherds in this class are unslipped on both interior and exterior surfaces, and over 80% of all sherds are either decorated only with twine impressions or left undecorated. Ninety-four percent of all slipped sherds and nineteen percent of all unslipped sherds are burnished. Eighteen percent of the sherds in this class showed fire blackening.

App.II: Figs.1-3

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	1				1
+ twine, + paint, - plastic	3	7			10
+ twine, - paint, + plastic	2	1	2	6	11
+ twine, - paint, - plastic	21	100	14	95	230
- twine, + paint, + plastic	2	1			3
- twine, + paint, - plastic		1		1	2
- twine, - paint, + plastic				1	1
- twine, - paint, - plastic	5	9	2	35	51
	34	119	18	138	

TABLE 9.2

UNRESTRICTED SIMPLE RIM (17) - POTLIDS N=309

Potlids range in diameter from 28 centimeters to over 38 centimeters. Almost 75% of all potlid sherds are decorated by twine impression alone; five out of six of these twine decorated sherds lack outer slip. An Additional table (below) demonstrates that the practice of slipping the interior surface of potlids was very common during Phase III. Seventy-seven percent of all slipped sherds and forty-five percent of the unslipped sherds were burnished. Thirty percent of all potlid rimsherds were fire blackened.

		+ inner slip	- inner slip
PHASE IV	M1 levels 1-12 M2 levels 1-12	35	109
PHASE III	M1 levels 13-20 M2 levels 13-16	110	15
PHASES I AND II	M1 levels 21-30 M2 level 17	8	32

App.II: Fig.8

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	4	1	2	2	9
+ twine, + paint, - plastic			2		2
+ twine, - paint, + plastic	2			1	3
+ twine, - paint, - plastic	1	1	2	1	5
- twine, + paint, + plastic	2	1	2	1	6
- twine, + paint, - plastic					
- twine, - paint, + plastic	2	2		2	6
- twine, - paint, - plastic	2	1	2	3	7
	13	6	9	10	

TABLE 9.3

UNRESTRICTED EVERTED RIM (21) N=38

Rims range in diameter from 30 centimeters to more than 38 centimeters. Forty-five percent of the sherds in this class have paint decoration, which is an unusually high percentage for the assemblage. No other systematic patterning of sherd attributes within this class is obvious from the table above. Ninety-four percent of all slipped sherds and fifty percent of the unslipped sherds are burnished. Ten percent of the sherds are fire blackened.

App.II: Fig.4

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic			1		1
+ twine, + paint, - plastic				1	1
+ twine, - paint, + plastic	1	1			2
+ twine, - paint, - plastic	3	2	1	3	9
- twine, + paint, + plastic	2				2
- twine, + paint, - plastic	1				1
- twine, - paint, + plastic	2	2		2	6
- twine, - paint, - plastic	3		5	5	13
	12	5	7	11	

TABLE 9.4

UNRESTRICTED THICKENED RIM (19,28) N=35

Rim diameter could be measured on only three rims, with results of 28 cm., 34 cm., and 38 cm. Sixty-three percent of the sherds in this class were either undecorated or decorated only with twine impressions. All of the slipped sherds and thirty-nine percent of the unslipped sherds were burnished. Fire blackening was noted on 17% of the sherds in this class.

App.II: Fig.4

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	4				4
+ twine, + paint, - plastic	1	13	2	1	17
+ twine, - paint, + plastic	9	4	7		20
+ twine, - paint, - plastic	22	67	14	44	147
- twine, + paint, + plastic	13		2	2	17
- twine, + paint, - plastic	6	5		1	12
- twine, - paint, + plastic	54	7	9	13	83
- twine, - paint, - plastic	52	16	23	33	124
	161	112	57	94	

TABLE 9.5

RESTRICTED SIMPLE (10,16,18,22,24,25) N=424

Diameters for the category of closed-mouth vessels ranged from 10 centimeters to 36 centimeters. The collapsed table below illustrates the tendency for restricted simple rims to be either unslipped and twine-impressed (30% of the sherds) or slipped and without twine decoration (37% of the sherds). Ninety-five percent of all slipped sherds were burnished. Fire blackening occurred on 12% of the sherds.

	+ outer slip	- outer slip
+ twine	59	129
- twine	159	77

App.II: Figs.5-6

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	9	7	1	1	18
+ twine, + paint, - plastic		1			1
+ twine, - paint, + plastic	14	2	11	4	31
+ twine, - paint, - plastic	2	4	8	6	20
- twine, + paint, + plastic	75	8	15	1	99
- twine, + paint, - plastic	1				1
- twine, - paint, + plastic	53	3	34	5	95
- twine, - paint, - plastic	9		6	4	19
	163	25	75	21	

TABLE 9.6

RESTRICTED CARINATED RIMS (7,11,14,23) N=284

Carinated vessel rims ranged from 12 centimeters to 38 centimeters in diameter. Eighty-five percent of the sherds have plastic decoration (usually grooves), and seven out of eight plastic-decorated sherds are slipped on the exterior. An unusual number of carinated sherds are painted (42%). In almost all cases, the paint appears in the grooves above the carination. The frequency table below demonstrates that groove and paint decoration on carinated rims was a Phase III style. Ninety-four percent of all slipped sherds and sixty percent of the unslipped sherds are burnished. One-third of all carinated sherds exhibit fire blackening.

		+ paint & plastic	- paint & plastic
PHASE IV	M1 levels 1-12 M2 levels 1-12	38	109
PHASE III	M1 levels 13-20 M2 levels 13-16	79	36
PHASES I AND II	M1 levels 21-30 M2 level 17	2	20

App. II: Figs. 7-14

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic					
+ twine, + paint, - plastic					
+ twine, - paint, + plastic					
+ twine, - paint, - plastic				2	2
- twine, + paint, + plastic	2		6	1	9
- twine, + paint, - plastic	1		2	1	4
- twine, - paint, + plastic	3		22	1	26
- twine, - paint, - plastic	20	1	37	14	72
	26	1	67	19	

TABLE 9.7

RESTRICTED LONG NECKED RIM (30,32) - BOTTLES N=113

Rim diameters for this class range between four and eight centimeters. Only two sherds (1.7%) had twine decoration. In general, sherds are characterized by outer slipping and lack of twine decoration (82%). All of the slipped sherds and none of the unslipped sherds are burnished. Only three percent of the sherds showed fire blackening.

App.II: Figs.15-16

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic		1	2		3
+ twine, + paint, - plastic			1		1
+ twine, - paint, + plastic	5		5	3	13
+ twine, - paint, - plastic	3	4	3	7	17
- twine, + paint, + plastic	5	2	1		8
- twine, + paint, - plastic	1				1
- twine, - paint, + plastic	13	1	17	4	35
- twine, - paint, - plastic	19	2	5	4	30
	46	10	34	18	

TABLE 9.8

RESTRICTED T-RIM (3,4) N=108

Diameters of T-rims ranged from fourteen to thirty-six centimeters. Fifty-six percent of all sherds in this class had outer slip and lacked twine decoration. Paint decoration was rarely applied to T-rims (9% of sherds), although plastic decoration (usually grooves) appears on 55% of the sherds. Ninety-six percent of all slipped sherds and sixty percent of the unslipped sherds are burnished. Twenty-two percent of the sherds are fire blackened.

App.II: Figs.17-18

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	1				1
+ twine, + paint, - plastic					
+ twine, - paint, + plastic	1		4	2	7
+ twine, - paint, - plastic	2	1	12	17	32
- twine, + paint, + plastic	2			1	3
- twine, + paint, - plastic	1				1
- twine, - paint, + plastic	11		8	5	24
- twine, - paint, - plastic	10		22	12	44
	28	1	46	37	

TABLE 9.9

RESTRICTED SLIGHTLY EVERTED RIM (2,31) N=112

Diameters of vessels with slightly everted rims ranged from ten to thirty-six centimeters. Patterns of attribute association were difficult to identify in this table, but one tendency is a preference for slipping and no twine, as the collapsed table below shows. All of the slipped sherds and nineteen percent of the unslipped sherds were burnished. Seventeen percent of the sherds in this class were fire blackened.

	+ outer slip	- outer slip
+ twine	20	20
- twine	54	18

App. II: Fig. 19

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic					
+ twine, + paint, - plastic					
+ twine, - paint, + plastic	2		1	2	5
+ twine, - paint, - plastic	2	3	1	7	13
- twine, + paint, + plastic	1		3		4
- twine, + paint, - plastic	1				1
- twine, - paint, + plastic	15		20	1	36
- twine, - paint, - plastic	19		14	10	53
	40	3	39	20	

TABLE 9.10

RESTRICTED EVERTED RIM (5,6,9,34) N=102

Diameters of the everted rimmed vessels ranged from twenty-four centimeters to more than thirty-eight centimeters. Seventy-one percent of the sherds in this class were slipped and lacked twine decoration. Over half of the total sherds were slipped but undecorated otherwise. All of the slipped sherds and thirty percent of the unslipped sherds were burnished. Fire blackening was exhibited by only ten percent of the sherds.

App.II: Figs.20-22

	+ inner slip		- inner slip		
	+ outer slip	- outer slip	+ outer slip	- outer slip	
+ twine, + paint, + plastic	1		2		3
+ twine, + paint, - plastic	2				2
+ twine, - paint, + plastic	8	1	4	1	14
+ twine, - paint, - plastic	3	2	1	14	20
- twine, + paint, + plastic	3	1	2	1	7
- twine, + paint, - plastic			1		1
- twine, - paint, + plastic	11	4	10		24
- twine, - paint, - plastic	13		11	10	34
	41	8	31	26	

TABLE 9.11

RESTRICTED THICKENED RIM (13) N=106

Rim diameters for this class ranged from twenty-two centimeters to over thirty-eight centimeters. Patterns of attribute association are difficult to identify in the table, but a tendency towards slipping and no twine impressing can be illustrated by means of the collapsed table below. Ninety-four percent of all slipped sherds and thrity percent of the unslipped sherds are burnished. Thirteen percent of the sherds in this class are fire blackened.

	+ outer slip	- outer slip
+ twine	21	20
- twine	51	16

App.II: Fig.25

With tables 9.1-9.11 available for inspection, we are able to assess whether any of the attributes under consideration appear to be consistently associated. In fact, one particularly noticeable pattern has emerged in the brief descriptions accompanying each table: unrestricted rims tend to have exterior surfaces which are unslipped and twine rouletted, whereas restricted rims are usually slipped and lack twine decoration. By collapsing the preceding eleven tables into one 2 x 2 x 2 table, it is possible to completely describe the Jenne-jeno pottery assemblage with respect to the three variables of rim shape, outer slip and twine decoration (Table 9.12).

Table 9.12
N=2273

	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	129	475	150	250
- twine	176	227	669	197

As expected, the two largest counts are for twine decorated unrestricted rims lacking outer slip and for slipped restricted rims lacking twine. It seems safe to assume that the cell frequencies in the above table reflect in some way the non-random behaviour of the potters at Jenne-jeno. Clearly, certain attribute combinations were preferred, although not exclusively. What is not immediately clear from inspection of the table is the nature of the relationships between variables which account for its structure. For example, it is possible that the attribute combinations +twine, -slip and -twine, +slip were favoured by the Jenne-jeno potters and that either combination could be applied to a pot regardless of its rim shape. In such a case, the structure in the contingency table would be the result of association between one pair of variables, twine and slip, and the two favoured combinations would occur with approximately equal frequency on unrestricted and restricted rims. An idealized 2 x 2 x 2 table illustrating this situation appears below:

Table 9.13
N=400

	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	0	100	0	100
- twine	100	0	100	0

This example (Table 9.13) is purposely extreme; it represents a situation which stands at an extreme remove from a table exhibiting no structure whatsoever (Table 9.14).

Table 9.14
N=400

	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	50	50	50	50
- twine	50	50	50	50

As Davis (1974: 200) points out, a table with the same frequency in all cells is "the essence of nothingness, since there is absolutely nothing going on of any statistical interest". Since equality of cross-products is a definition of independence, it is clear that Table 9.14 is a model of independence—the cross-products (calculated for any two numbers on a diagonal) all equal 50 x 50. Quite the opposite is true for Table 9.13; one set of diagonal products equals zero, the other equals 100,000. Tables of empirically-derived data are rarely so accomodating.

More complex relationships, such as pairwise association between two pairs of variables, also may be responsible for structure within a 2 x 2 x 2 table. Consider a case where potters decide whether or not to slip a pot, as well as whether or not to twine impress a pot, on the basis of rim shape. The table below (9.15) illustrates this situation:

Table 9.15
N=242

	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	10	100	10	1
- twine	1	10	100	10

By inspecting the association of twine and slip for each of the two attributes of rim shape, we can confirm that the cross-products of twine and slip attributes for both restricted and unrestricted rims are equal (10 x 10 = 1 x 100). Since equal cross-products define independence, as noted above, our interpretation is that twine and slip are not associated, and that the obvious structure in the table is produced by rimshape-twine and rimshape-slip association alone.

Another possible relationship is pairwise association between all three pairs of variables, an extreme example of which is given:

Table 9.16
N=400

	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	0	200	0	0
- twine	0	0	200	0

The final and most complex relationship possible in a 2 x 2 x 2 table relates all three variables such that the interaction between any two variables depends on the value of the third variable. An example of this kind of structure appears below:

Table 9.17 N=400	unrestricted rim		restricted rim	
	+ outer slip	- outer slip	+ outer slip	- outer slip
+ twine	0	100	100	0
- twine	100	0	0	100

Rarely is visual inspection of a multidimensional table sufficient to identify the nature of complex two-variable or three-variable relationships within the table. Fortunately, statistical methods permitting the systematic examination of all possible relationships in a table have recently been greatly refined. For readers lacking sophisticated statistical knowledge, major references on these methods include Fienberg (1977) and Davis (1974). Archaeological applications have been considered by Read (1974), Clark (1976) and Spaulding (1976). The discussion which follows here attempts to outline the concepts central to an understanding of these methods. Lacking the mathematical expertise and talent required for a truly informed exposition on this topic, I have opted for simplicity and brevity.

The Statistical Analysis of Multidimensional Contingency Tables

A basic understanding of the concept of models will take us a long way towards explaining the logical structure of the analytical methods under consideration. The operation central to these methods is the construction and testing of models, which are "sets of semi-artificial data created by the analyst and having some statistical property. The analyst creates a series of models, compares them with actual data, and uses the discrepancies or lack of discrepancies to assess the presence of various statistical effects" (Davis 1974: 199).

The most familiar use of this concept is the standard chi-square test. In essence, the chi-square test postulates a model where the variables within a contingency table, for example, are independent(i.e., not associated), calculates the expected frequencies that would arise under the independence hypothesis, and investigates the similarity of the expected to the observed frequencies. Should the model perfectly predict the observed cell counts, the chi-square will equal zero. But if the empirical data differ significantly from those we might expect to draw from a population in which the variables were independent, then we must conclude that the model does not fit the actual data and the variables are not independent. The level of significance of the chi-square statistic is obtained by consulting a table of chi-square values for the appropriate degrees of freedom (independent comparisons in table).

With the concept of models at least partially digested, we can regress a page or so and recall the various kinds of relationships which may account for structure in a 2 x 2 x 2 table. To summarize, it is possible to have association between one, two, or all three pairs or variables, or to have

The transformed data for the Jenne-jeno pottery assemblage are presented in Table 9.25; the results of the loglinear analysis of these data compose Table 9.26.

Table 9.25 N=100		unrestricted rim		restricted rim	
		+ outer slip	- outer slip	+ outer slip	- outer slip
	+ twine	5.67	20.90	6.60	11.00
	- twine	7.74	9.99	29.43	8.67

Table 9.26	(a)	(b)	(c)	(d)	(e)	(f)
Model 1 G^2= df=4	30.76	30.76	30.76	30.76	30.76	30.76
Model 2 df=3	15.48	15.48	18.81	18.81	22.62	22.62
Model 3 df=2	3.48 p=0.17	7.34	3.48 p=0.17	10.67	7.34	10.67
Model 4 df=1	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46

In Table 9.26 we see that Model 3(c) has a very low G^2 (3.48) and a probability of 0.17. Moreover, this G^2 represents a significant drop in G^2 from Model 2(c).

Strong association between twine and slip and between slip and rim shape is thereby established. Equipped with this result, we have a very good basis for reconstructing the major culturally imposed rules observed by the Jenne-jeno potters as follows: the normal exterior surface treatment for a restricted rim is slipping, while unrestricted vessels and potlids are usually left unslipped; once the decision to slip or not to slip has been made, twine decoration is normally applied only to pots (or areas of pots) which are unslipped, regardless of rim shape.

This is a most gratifying result, permitting, as it seems to, a peek into the collective mind of the Jenne-jeno potters—an opportunity to think as they thought, perhaps. I would be seriously remiss in my analysis, however, if I failed to investigate the possibility that the order perceived in Table 9.12 by means of loglinear analysis is entirely an artifact of collapsing into one table the data from many excavated levels. It is impossible to know at this point whether the association described by Model 3(c) was non-existent at one point in time and became very strong indeed at another, or if significantly different patterns of association in each of the two test pits have combined in the collapsed table to create an entirely new pattern. A breakdown of the original data set into subsets defined by test pit and time period is required.

For purposes of efficiency and consistency, the major chronological units used will be the occupation phases defined in an earlier chapter (p. 96; Table 7.7). The technique used to examine the question of attribute analysis for the pottery in each of these different subsets must permit comparisons

which are not clouded by the effects of sample sizes that vary from subset to subset. Of course, we have already employed a technique which standardizes N by converting all original cell frequencies into percentages. For every table, N equals 100. This method enables us to make meaningful comparisons between subsets as to the nature and magnitude of the relationships exhibited by each. Once again, we will be using loglinear analysis merely for detecting the stronger relationships as opposed to identifying all nonrandom relationships in the original data.

Let us see how the results for the six subsets of pottery from Jenne-jeno (Tables 9.27 and 9.28) compare with each other, as well as with the results for the original reduced table(Table 9.25). Remember that the 'best fit' model will be signalled by a low G^2 value (and accompanying high probability value) which represents a significant drop in G^2 from a preceding model. The first major conclusion arising from this comparison is that in none of the six subsets was Model 3(c) the 'best fit' model. It is also important to note that the pottery data from both test pits consistently exhibited similar structure, thereby reaffirming the homogeneity of the cultural deposits at Jenne-jeno through horizontal space. The loglinear analyses of the six pottery subsets are interpreted in Table 9.29.

The interpretation of the loglinear analyses suggests an interesting trend from simple to more complex potting rules through time. In essence, potters during the earliest phases (I and II) recognized (or, more circumspectly, acted as if they recognized, with a few exceptions) this rule: for all pots, regardless of rim shape, only unslipped pots should be twine decorated. In Phase III, however, the logic was apparently more complex: the normal decoration for an unrestricted rim is twine impression, while restricted rims are either decorated with paint and plastic motifs or are left plain. Once the decision to twine impress or not to twine impress has been made, regardless of rim shape, slipping is normally applied only to pots (or areas of pots) which have no twine decoration. Phase IV potters seem to have been interested in producing two types of pot in abundance: pots with unrestricted rims bearing twine decoration and no slip; and vessels with restricted rims having slip but no twine decoration.

This reconstruction of potting rules observed by the Jenne-jeno potters through time is, of course, only an inference based on the results of loglinear analysis. The logic behind the inference is impressive, though not infallible: potters at Jenne-jeno were clearly not indifferent to the manner in which slip or twine could be applied to various shapes of pot; statistical analysis confirms that they did not rely on a kind of mental coin-toss to decide whether or not to slip a restricted rim, for example. We have interpreted this lack of randomness, or alternatively the presence of order, in the data as resulting from the collective preferences of the potters for certain combinations of twine, slip and rim shape attributes. Such collective preferences may be further interpreted as culturally imposed rules of potting behaviour. In other words, I am asserting that the relationships described above were culturally significant to the producers of the Jenne-jeno pottery. Through the application of loglinear analysis, we have achieved one of the most fundamental goals of archaeology: the discovery and description of culturally imposed order in archaeological data.

Table 9.27 Results of loglinear analysis of the pottery from major occupation phases at Mound 1.

PHASES I AND II (N=100)

		(a)*	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	29.53	29.53	29.53	29.53	29.53	29.53
Model 2 df=3		4.75 p=0.19**	4.75 p=0.19	27.91	27.91	24.90	24.90
Model 3 df=2		3.13 p=0.21	0.12 p>0.5	3.13 p=0.21	23.28	0.12 p>0.5	23.28
Model 4		0.05 p>0.5	0.05 p>0.5	0.05 p>0.5	0.05 p>0.5	0.05 p>0.5	0.05 p>0.5

PHASE III (N=100)

		(a)	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	47.06	47.06	47.06	47.06	47.06	47.06
Model 2 df=3		18.58	18.58	34.97	34.97	31.65	31.65
Model 3 df=2		6.49 p=0.04	3.17 p=0.20	6.49 p=0.04	19.56	3.17 p=0.20	19.56
Model 4		0.00 p>0.5	0.00 p>0.5	0.00 p>0.5	0.00 p>0.5	0.00 p>0.5	0.00 p>0.5

PHASE IV (N=100)

		(a)	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	25.56	25.56	25.56	25.56	25.56	25.56
Model 2 df=3		17.78	17.78	12.05	12.05	17.89	17.89
Model 3 df=2		4.27 p=0.12	10.11	4.27 p=0.12	4.38 p=0.11	10.11	4.38 p=0.11
Model 4 df=1		0.54 p=0.46	0.54 p=0.46	0.54 p=0.46	0.54 p=0.46	0.54 p=0.46	0.54 p=0.46

*hierarchies a-f are listed in Table 9.22
**p values given only when p>0.01

Table 9.28 Results of loglinear analysis of the pottery from major occupation phases at Mound 2.

PHASE II

		(a)*	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	33.56	33.56	33.56	33.56	33.56	33.56
Model 2 df=3		9.91 p=0.02**	9.91 p=0.02	26.25	26.25	31.88	31.88
Model 3 df=2		2.59 p=0.27	8.22	2.59 p=0.27	24.56	8.22	24.56
Model 4 df=1		2.59 p=0.11	2.59 p=0.11	2.59 p=0.11	2.59 p=0.11	2.59 p=0.11	2.59 p=0.11

PHASE III

		(a)	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	64.36	64.36	64.36	64.36	64.36	64.36
Model 2 df=3		28.57	28.57	46.41	46.41	40.07	40.07
Model 3 df=2		10.62	4.29 p=0.12	10.62	22.13	4.29 p=0.12	22.13
Model 4 df=1		0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46	0.55 p=0.46

PHASE IV

		(a)	(b)	(c)	(d)	(e)	(f)
Model 1 df=4	G^2=	38.70	38.70	38.70	38.70	38.70	38.70
Model 2 df=3		30.50	30.50	13.16	13.16	29.01	29.01
Model 3 df=2		4.96 p=0.08	20.81	4.96 p=0.08	3.47 p=0.18	20.81	3.47 p=0.18
Model 4 df=1		0.98 p=0.32	0.98 p=0.32	0.98 p=0.32	0.98 p=0.32	0.98 p=0.32	0.98 p=0.32

* hierarchies a-f are listed in Table 9.22
** p values given only when p>0.01

Table 9.29 Interpretation of the loglinear analysis

	Mound 1	Mound 2
PHASES I+II	Model 2 (AB association) G^2 =4.75 p=0.19 Interpretation: association between twine and slip is causing the majority of the structure in this table.	Model 3(a) (AB + AC association) G^2=2.59 p=0.27 Interpretation: association between slip-twine and slip-rim provides a good fit to the data, with slip-twine the stronger of the two relationships as indicated by Model 2(a) and (b) results: G^2=9.91 and p = 0.02)
PHASE III	Model 3(b) (AB + BC association) G^2=3.17 p=0.20 Interpretation: strong association between slip-twine and rimshape-twine is unquestionably responsible for a great deal of the structure in the original data.	Model 3(b) (AB + BC association) G^2=4.29 p=0.12 Interpretation: as in Mound 1, Phase III, association between slip-twine and rim-twine accounts for a good deal of the structure in the original data. Slip-twine is the stronger relationship.
PHASE IV	Models 3(a) and (d) (AB + AC association; AC + BC association) G^2=4.27 p=0.12; G^2=4.38 p=0.11 Interpretation: It was difficult to choose a 'best fit' model for this phase. Clearly, there is significant association between slip-twine and slip-rimshape, as well as between twine-rimshape and slip-rimshape.	Model 3(d) (AC + BC association) G^2=3.47 p=0.18 Interpretation: association between twine-rim and slip-rimshipe accounts for much of the structure in the original data. There is a weaker relationship between slip-twine and slip-rimshape (Model 3a - G^2=4.96 p=0.08).

Summary Description of the Jenne-jeno Pottery Assemblage

Phase I (c. 250 B.C.-A.D. 50). The majority of the rim sherds from Phase I occupation levels were either simple unrestricted rims (approximately 30%) or simple restricted rims (35-40%). Rims from more complex forms, such as T-rim bowls, carinated forms and everted rims, are extremely rare. Most of the Phase I vessels must have had rounded bottoms because only two to six percent of the non-rim sherds are base fragments. This is, however, the highest relative frequency of base sherds from any phase at Jenne-jeno. Ring bases predominated but flat bases are also found. Several fragments of pot legs were also recovered.

In general, Phase I pottery was extremely well made. Up to fifty percent of the sherds were made of a fine, sand-tempered paste; well over half of the sherds were characterized by the clear red/orange colours that result from full oxidation of ferric oxide clays which have been well-fired at moderate temperatures (750-850°C). The majority of the sherds (over 75%) were painstakingly decorated with twine impressions, although twining appears far less frequently on rim sherds than on body sherds. By far the most popular twine motif was a woven 'fishnet' pattern (Twine 4) but two types of wound roulette (Twines 6 and 7) each accounted for almost twenty percent of the twine impressed sherds. More than half of all Phase I rim sherds had outer slip. Statistical analysis indicates that the potters of this period strongly preferred not to place twine impression and outer slip together on a given area of pot surface. Other decorative motifs, such as grooves or paint, were infrequently applied during Phase I.

Phase II (c. A.D. 50-AD. 400). Phase II pottery is very similar to Phase I pottery in nearly all respects. Some changes do take place however. The relative frequency of sherds with fine, sand-tempered paste decreases steadily such that, by the end of the period, over ninety percent of all sherds are from a medium textured paste tempered with grog. Twine decoration decreases very slightly in frequency, but Twines 4 and 6 remain as popular as before. Twine 7 disappears at the end of Phase II. Increasingly, the practice of slipping the inner surface of pots becomes common.

Phase III (c. A.D. 400-A.D. 900). The pottery assemblage from Phase III levels is dominated by vessels with restricted rims. Simple restricted rims continue to account for over twenty percent of the rim sherds, but carinated forms rise substantially in popularity throughout the period and ultimately comprise twenty-five percent of the rim sherds. Twine impression continues to be the major decorative motif—approximately two out of every three Phase III sherds are twine decorated, and Twine 4 ('fishnet')weave) is still the most popular twine pattern. The relative frequency of paint decoration increases dramatically in the first half of the period, but wanes in the latter part. Often, paint was applied over parallel grooves incised into the pot surface. This mode of decoration is frequently found on the carinated rims which are characteristic of Phase III.

The relative frequency of clear, well-fired paste colours holds steady at 45-55%; paste texture is predominantly medium with grog temper, but up to twenty percent of the sherds are made from a coarse, poorly mixed paste. An impressive majority of the Phase III rims have slip on their inner surface.

Phase IV (c. A.D. 900-A.D. 1400). During Phase IV, there is a resurgence in the popularity of simple unrestricted rims, which comprise 40-50% of the assemblage in several levels. Also on the quantitative upswing are T-rims and everted rims. Both carinated forms and simple restricted rims decline markedly in relative frequency.

Coarse, poorly-made paste characterizes over one-quarter of the sherds from some levels, and there is a feeling, even about the remaining medium-textured sherds, that the pottery of Phase IV was less carefully executed than that of preceding periods. Up to a third of the rim and body sherds recovered from Phase IV levels were undecorated. Of the decorative variables, paint was infrequently applied, and plastic decoration continues unchanged from Phase III in relative frequency. Twine impression, however, declines to between forty to sixty percent of the rim and body sherds. Chevron woven twine motifs (Twines 1 and 2) are tremendously popular during Phase IV. Statistical analysis of the pottery indicates that the potters of this period were particularly interested in producing two types of pots: pots with unrestricted rims having twine decoration and no slip; and vessels with slipped restricted rims and no twine.

SPECIAL POTTERY FINDS

Terracotta Statuette and Associated Pots

Without a doubt, the most dramatic moment of the 1977 field season was the discovery in M2 Level 2, between 660-875 mm depth, of a terracotta statuette in association wih five assorted ceramic objects and pots. Stylistically, the statuette (Plate IX), showed strong affinities to the wide-eyed, prognathic style that is well-known from the Inland Niger Delta. The following description of the Jenne-jeno statuette is taken from an article by the authors (1979), in which all aspects of the find, including an interpretation of the archaeological context and a discussion of its possible functional significance, are set forth.

> "The figure is in a kneeling posture with the legs forming part of the rectangular base. Some kind of covering from the waist to just above the knees is suggested by a series of incised parallel lines. The arms are crossed over the chest with hands resting on the shoulders. A large torque hangs about the neck, and a number of deep incisions at the wrist and lower arm undoubtedly represent bracelets. The head is markedly prognathous and flattened along the axis of the chin. The terracotta was slipped a deep reddish-brown".

The five pieces of pottery associated with the statuette are described in Table 9.30 and illustrated in Figures 42 and 48 in Appendix II.

Pottery with Raised Relief Representations

From M2 Level 2, four fragments of knobbed potlids were recovered (depth 0-100 mm). All seemed to be associated with Jar no. 20, a painted globular pot of unusually fine manufacture (App. II: Fig. 43). One potlid fragment had a headless human motif (App. II: Fig. 46); another displayed what appears to be a serpent (App. II: Fig. 47). The subjects depicted on the

Table 9.30 Pottery Objects Association with Terracotta Statuette in M2 Level 2.

Pot No.	Description
13	Two halves of a hollow terracotta sphere with a knob-like protuberance on top and a series of serpentine motifs in raised relief. Twine impressions have been applied on the surface between the raised snake motifs. Height: 140 mm; diameter: 120 mm; wall thickness: 12 mm. The entire surface was originally covered with red slip, most of which has flaked off. The fabric is grog-tempered and extremely coarse in texture. It appears that the piece was poorly made; the fabric is so full of air pockets due to careless mixing and lack of aeration of the clay that the object is literally crumbling to pieces.
14	U-shaped beaker with protruding flanges. Height: 160 mm; maximum diameter: 135 mm; wall thickness: 15 mm. The exterior surface of the pot is slipped a light orange overall. The fabric is medium textured with grog temper. The fabric is very crumbly and appears to have been made from a poorly prepared and poorly fired clay. App. II: Fig. 48.
15	Crude ceramic "mortar and pestle" (App. II; Fig. 48). The "mortar" is very crudely executed; both its shape and surface are uneven. The clay is poorly prepared; an unburnished red slip has been applied over the entire pot surface. Fabric: medium with grog. Height: 74 mm; maximum diameter: 120 mm; wall thickness: 11 mm. The "pestle" is made from a solid and well-fired piece of coarse grog-tempered clay. Red slip has been applied and a raised serpentine effect achieved by stabbing at alternate sides of a raised cordon. Circular stamped decoration is also present. The "pestle" was resting inside the "mortar" in situ.
16	Carinated pot, described in Appendix II: Figure 42. The pot contained traces of rice (Oryza glaberrima) and purslane (Portulaca oleracea), which may be the remains of a food offering.

remaining two fragments are difficult to identify, although our workmen suggested that the portrayal was of an anteater (App. II: Figs. 44, 45). Traces of red painted geometric design were visible on two of the fragments.

Clay Figurines

A number of zoomorphic and anthropomorphic figurines ranging from 3 to 7 cm in length were recovered from various levels. They are described in Table 9.31.

Table 9.31 Zoomorphic and Anthropomorphic Clay Figurines

Provenience	Description
M1 Level 1	fired clay zoomorphic figurine, possibly horse or cow
M1 Level 5	fired clay anthropomorphic figurine; bottom of torso and top of legs
M1 Level 12	fired clay cow figurines?
M1 Level 12	fired clay anthropomorphic figurine—torso only
M1 Level 14	fired clay anthropomorphic figurine—torso
M1 Level 14	two fired clay objects resembling arms, possibly from anthropomorphic figurine
M1 Level 14	fired clay zoomorphic figurine—cow? (App. II: Fig. 49)
M1 Level 22	three unfired clay zoomorphic figurines—possibly cows

Spindle Whorls and Clay Beads

It is sometimes difficult to draw a convincing line between clay beads and spindle whorls when the predominant shape for both is the sphere. The defining characteristic used here is perforation diameter: the perforation in a spindle whorl must be large enough to accommodate a small stick. Perforation diameters of the spindle whorls identified at Jenne-jeno range from 3-5 mm; clay bead perforation diameters are less than 2 mm.

Table 9.32 Spindle Whorls

Provenience	Description	Diameter	Weight
JF2 Level 1	Sub-spherical, slightly flattened. Undecorated	23 mm	8 gm
JF2 Level 1	Biconical, undecorated.	24 mm	7 gm
M2 Level 1	Two spherhical, undecorated spindle whorls	19 mm	4 gm
M2 Level 1	Lenticular, made of extremely fine paste, fired black. Decorated with parallel incised lines and oblique hatching.	diam.= 20 mm length= 33 mm weight= 12 gm	

M2 Level 1	Fragment of biconical spindle whorl made of fine paste and fired to a black colour. Undecorated.	28 mm	10 gm
M1 Level 5	Spherical, undecorated.	15 mm	3 gm

Table 9.33 Clay Beads (perforations less than 2 mm in diameter)

Provenience	Description	Diameter	Weight
JF1 Level 1	Undecorated, sub-spherical fired clay bead.	16 mm	3 gm
JF2 Level 1	Undecorated, flattened, fired clay bead.	13 mm	1 gm
JF1 Level 6	Possible bead, partially perforated, teardrop shape.		2 gm
M1 Level 1	Two undecorated, spherical fired clay beads.	13 mm 14 mm	2 gm 3 gm
M1 Level 1	One tubular, undecorated fired clay bead.	6 mm	1 gm
M2 Level 10	One spherical, fired clay bead. Undecorated.	13 mm	2 gm

Miscellaneous

A number of unusual clay objects were found whose use could not be definitely ascertained. These are described in Table 9.34 below.

Table 9.34 Miscellaneous Clay Objects

1. "Spoons" Four of these were found (one each from Levels 13, 17, 19, and 20 of M1), each of which had a handle at one end and a scooped-out area at the other. Similar objects were found at E1 Oualedji, where they have been interpreted as crucibles (creusets) (Lebeuf and Pacques 1970: 31). The Jenne-jeno examples show no traces of re-heating after initial firing; their function is unknown.

2. Bracelet or anklet. A fragment of a light-orange slipped, fired clay bracelet or anklet was recovered from JF1 Level 3, at a depth of 580 mm, from a spot just west of Skeleton 3. The object was oval in cross-section, measuring 22 mm at the widest point and 17 mm in thickness. The inner diameter of the bracelet/anklet would have been approximately 80 mm.

3. "Nail". A buff-coloured, fired clay object resembling a blunt nail (Pl. X) was recovered from M1 Level 25. It was made from an extremely fine paste, and measured 51 mm in length, 8 mm in diameter (body), 13 mm diameter (head). Its function in unknown.

4. "Potstands". These enigmatic pieces are interpreted as basal fragments from pots which were originally supported by three curved legs. The shape may have been similar to that of the "Tellem bowl" known from archaeological deposits in the Bandiagara region of Mali (Bedaux, in press). The three "potstands" from Jenne-jeno were recovered from M1 Level 1, M1 Level 15, and M1 House 6.

5. "Crucible" A small, deep, cup-shaped object of blackened fired clay (App. II; Fig. 49) was found at a depth of 805 mm in M1 Level 8. Its dimensions are: outer diameter: 46 mm; inner diameter: 30 mm; height: 28 mm. The piece is fragmentary, and it looks as if a handle has broken off one side. No traces of metal or any other substance are visible in the bottom. Only the black colour and the size (R. J. McIntosh has observed goldsmiths in Ghana using crucibles of precisely this size) combine to suggest that this object may have been used as a crucible.

6. "Pendant". A fired clay object, conical in shape and perforated, was found in M1 Level 13. It may have been used as a pendant.

7. "Pottery goldweight". A potsherd which seems to have been deliberately chipped and rounded into an oval shape (App. II: Fig. 49) was retrieved from JF1 Level 6. This object may have been shaped for use as a gaming counter or rubber; however, the fact that the weight of this shaped sherd (7.0 grams) falls convincingly within the Islamic weight standard opens the possibility that the sherd functioned as a weight measure.

The use of goldweights made of brass, iron, lead, and stone which conform to the Islamic weight series is well-known in West Africa. The most famous example is undboutely the brass goldweights of the Akan region of Ghana. The Islamic weight standard represented by the Akan goldweights was initially diffused from North Africa to Jenne and Timbuktu in consequence of trade and thence to Ghana (Garrard 1975: 62). This weight series was based on a common trade ounce (uquiya) of 27.3 grams, which can be traced back through the Arabs to the Romans (Garrard 1975: 63). The uquiya was divided into $\frac{1}{2}$, $\frac{1}{4}$, 1/8, 1/16, etc. Use of this weight series continued into this century at Jenne. In 1955, a group of metal and stone weights was purchased from a Jenne trader. Eight specimens, given as 13.75 13.77, 13.85, 19.95, 38.92, 53.19, and 108.43 grams represent $\frac{1}{2}$, $\frac{3}{4}$, $1\frac{1}{2}$, 2, and 4 uquiya (ounces), and the ounce has an average weight of 27.1 grams (Mauny 1961: 418, reported in Garrard 1975: 63).

T. F. Garrard was the first to suggest that the carefully shaped discs of pottery found at numerous 'medieval' archaeological sites in Ghana and usually interpreted as gaming pieces or counters be weighed. Nine perfect specimens from Begho weighed 6.5, 13.1, 13.3, 13.5, 13.8, 20.1, 20.4, 20.9, and 21.2 grams, represent g $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ ounce, based on an average ounce of 27.2 grams (Garrard 1975: 65). Three pottery discs from Gao (Mali) weighed 13.0, 43.5, and 52.5 grams, representing $\frac{1}{2}$, $1\frac{1}{2}$ and 2 trade ounces, with an average ounce of 27.25 grams (Garrard 1975: 66). Oral tradition collected by Garrard substantiates the use of pottery weights (Garrard, personal communication).

After examining a photograph and description of the shaped potsherd from Jenne-jeno, Garrard offered the following opinion in a letter dated January 20, 1978:

> "This may be regarded as falling neatly within the Islamic ounce standard. It could easily represent the common unit of $\frac{1}{4}$ Islamic ounce, whose expected standard at Jenne would be 6.83 grams. The sherd is close to this theoretical standard; the difference, little more than one two-hundredth of an ounce, is so slight that it could pass without difficulty as a reasonably accurate weight of $\frac{1}{4}$ Islamic ounce. Monteil (1903) recorded a metal weight of 7.1 grams at Jenne, then being used for weighing silk, which evidently represents the same $\frac{1}{4}$ ounce; he also records a half-ounce weight of 14.0 grams. Having regard to its other features—the very regular shape and incised lines—I see no difficulty in accepting it (the Jenne-jeno sherd) as a pottery weight".

In view of Garrard's opinion, several aspects of the sherd in question take on new interest: the incised decoration on the sherd is unique among the nearly 10,000 sherds examined from Jenne-jeno; the sherd paste appears to have been tempered with chaff or straw, also a unique feature; and the sherd was recovered from a level that seems, on the basis of the pottery chronology developed for the site, substantially to antedate A.D. 900.

STONE ARTIFACTS

Grinding and Rubbing Stones

Four small blocks of sandstone (less than 15 centimetres long) were found, all of which had been pecked into rectangular or trapezoidal shapes. All exhibited wear and rounding as a result of abrasion. Three of the grinding stones lay on the floor of House 4 (Level 6) in M2. The other grinding stone came from M1 Level 14. Additionally, a small pyramidal pecked and abraded rubbing stone was recovered from M1 Level 8 (App. II: Fig. 50). It might be noted here that sandstone does not occur naturally within the Inland Niger Delta.

Stone beads

Stone beads, all of which must have been traded into Jenne-jeno in view of the lack of stone in the Inland Niger Delta, occur throughout the deposits. All beads are biconically perforated except one from the highest level of M1 which has a straight perforation. Mauny (1961: 58) has observed that the arrival of the Arabs in sub-Saharan Africa was associated with the introduction of new stone working techniques which permitted long, straight perforations to be made in stone beads.

Table 9.35 Stone Beads

Provenience	Description	Maximum Diameter
M1		
Level 1/2	Polished black-and-white cylindrical bead, broken. Perforation: straight, 2.1 mm minimum diameter. (Plate XI:f)	10.7 mm
Level 5	Polished rose quartz cylindrical bead; slightly rounded sides. Height measured parallel to perforation: 10.8 mm. Perforation: biconical, 3.0 mm minimum diameter. (Plate XI:n)	17.2 mm
Level 12	Polished, light grey quartz bead, rounded sides, flattened at poles. Height: 4.1 mm. Perforation: biconical, 2.2 mm minimum diameter. (Plate XI:j)	9.8 mm
Level 15	Polished rose quartz cylindrical bead. Height: 3.8 mm. Perforation: biconical 1.8 mm minimum diameter. (Plate XI:k)	8.1 mm
Level 23	Polished, colourless, translucent quartz bead—barrel-shaped. Height: 13.1 mm. Perforation: biconical, 1.9 mm minimum diameter. (Plate XI:l)	10.6 mm
Level 30	Polished grey-and-white cylindrical bead. Height: 9.3 mm. Perforation: biconical, 1.8 mm minimum diameter. Perforation badly off-centre. (Plate XI:m)	9.0 mm
M2		
Level 12	Polished, brown, sub-spherical bead. Height: 7.6 mm. Perforation: biconical, 1.8 mm minimum diameter. (Plate XI:i)	8.9 mm

GLASS ARTIFACTS

Glass Beads

Five glass beads were found, all of which were quite small. Four of these beads came from levels dated to later than A.D. 1000, and all four have in common a general carelessness of workmanship. The perforation is off-centre in three of these beads, and none is symmetrical in shape. The fifth bead, from JF1 Level 6, is puzzling because it comes from a level which appears, on the basis of the ceramic chronology devised for the site, to antedate A.D. 600. The existence of trade in glass beads prior to the tenth century A.D. is not historically documented in West Africa. The bead, although fragmentary, is clearly well-made, with very thin walls unlike the later beads. It seems to have been perfectly symmetrical, and is a very clear, translucent light blue in colour.

Table 9.36 Glass Beads

Provenience	Description	Maximum Diameter
M1		
Level 1	Small, dully opaque, turquoise bead. Perforation diameter: 1.8 mm. (Plate XI: a)	5.1 mm
M2		
House 4	Dark blue, dully opaque bead, Exterior is incised, Height: 7.5 mm. Perforation diameter: 2.8 mm (Plate XI:b)	9.8 mm
Level 5	Small, shiny, opaque, dark blue bead. Height, 2.9 mm. Perforation diameter: 1.1 mm. (Plate XI: c)	3.2 mm
House 7	Small, dull opaque yellow bead. Height: 1.8 mm. Perforation diameter: 1.1 mm. (Plate XI: d)	3.8 mm
JF1		
Level 6	Fragment translucent blue bead. Perforation diameter: 2.2 mm (Plate XI: e)	3.4 mm

METAL ARTIFACTS

Copper Artifacts

Finds of copper were comparatively rare. In every case where the pieces recovered were not too fragmentary to be identified, they appeared to be decorative in function. No weapons or tools of copper were found. Two of the copper artifacts recovered were recognized by the workmen as female hair ornaments (Plate XII c and f). The copper finds are currently being analyzed to determine whether they are pure or alloyed copper.

Identifiable Iron Artifacts

Identifiable pieces of iron were far outnumbered by badly corroded fragments whose original form could not be determined. Three classes of utilitarian objects were distinguished among the identifiable iron artifacts: projectile points, fishhooks, and knife blades. Small projectile points like those pictured in Plate XIII (f, g and h) are used today by the Bozo of the Inland Niger Delta as fishing spears, so the Jenne-jeno points need not necessarily have functioned as weapons. In addition to utilitarian items, decorative objects, including bracelets and rings, were also made of iron.

Unidentifiable Iron Artifacts

In all, 145 fragments of unidentifiable iron totalling 576 grams were recovered from the excavations. Among these fragments were numerous examples of iron "wire", which has round cross-section and a diameter of less than three millimetres. P resumably, the "wire" was drawn from a drawplate.

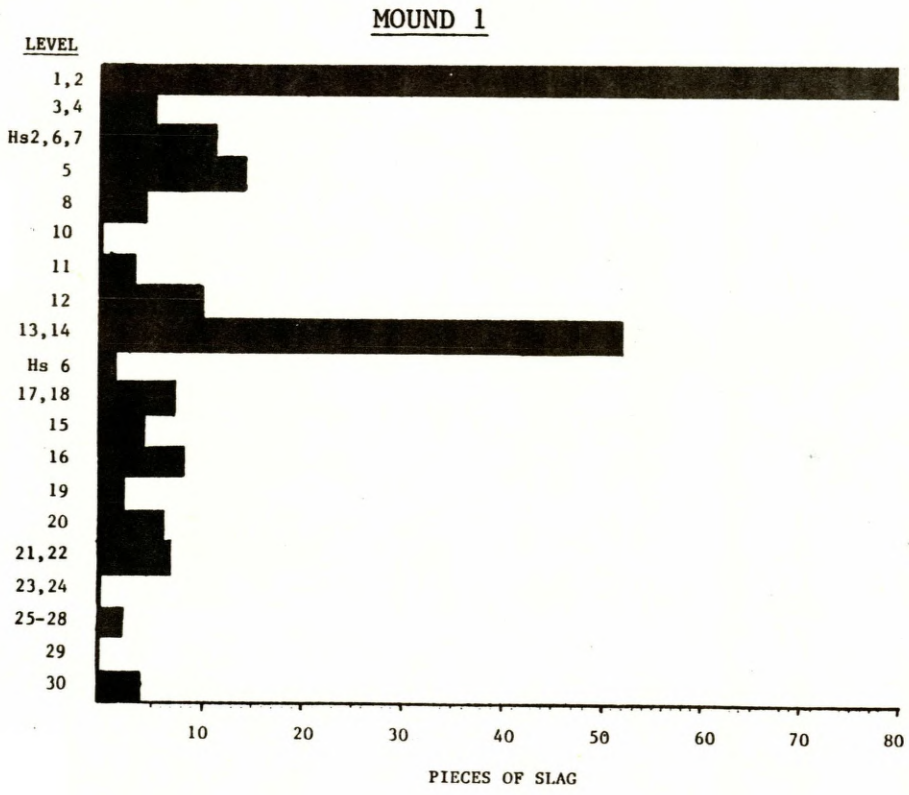
Slag

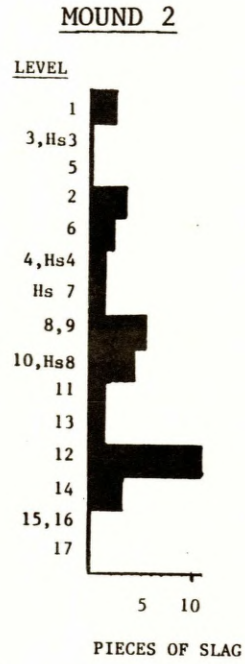
Pieces of slag were fairly common throughout the deposits at Jenne-jeno, indicating that metal was smithed at the site during the entirety of its occupation. A total of 297 pieces of slag was recovered from the three excavation units. Slag counts from each excavated level in M1, M2 and JF2 are presented graphically in Figure 9.2.

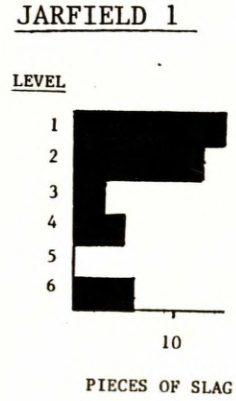
Table 9.37 Copper Objects

P rovenience	Description	Weight
M1		
Level 5	Waisted cylinder. Minimum inside diameter 5.2 mm; thickness - 2.2 mm. (Plate XII:f)	4 gm
Level 14	Fragment—unidentifiable	2 gm
Level 20	Nodule—unidentifiable	1 gm
M2		
Level 1	Fragment—unidentifiable	1 gm
Level 2	Fragment of chain-link? Found in section: 2 mm diameter (Plate XII:e)	<1 gm
Level 5	Bead spacer? Flat in section: 1 mm thick; 2 mm wide; 3.5 mm inside diameter (Plate XII:a)	<1 gm
Level 8	Bifurcated ornament, possibly for the hair. Thickness: 2.2 mm (Plate XII:c)	3 gm
Level 10	Ornament with perforation, possibly for the hair. Tapers to a point: maximum thickness 7.0 mm, minimum thickness - 2.0 mm (P late XII:d)	2 gm
Level 12	Two fragments—unidentifiable	5 gm

FIGURE 9.2 Pieces of slag per level







JF1		
Level 1	Fragment—unidentifiable	2 gm
Jar 1	Fragment of a finger ring. Round in section: 2.5 mm diameter (Plate XII:b)	< 1 gm
JF2		
Level 1	Bead	< 1 gm

Table 9.38 Identifiable Iron Objects

Provenience	Description	Weight
	UTILITARIAN	
M1		
Level 1	Point. Shaft is round in section, 4. 7 mm diameter. (Plate XIII:f)	3 gm
Level 4	Fishhook. Round in section, 4.9 mm diameter. (Plate XIII:a)	3 gm
Level 7	Point. Shaft is round in section, 4.9 mm diameter. (Plate XIII:h)	3 gm
Level 12	Tanged point. Shaft is approximately round in section, diameter 4.9-5.1 mm, point is hammered flat, thickness 1.8 mm (Plate XIII:g)	5 gm
Level 15	Large fishhook, badly corroded. Round in section, c. 8 mm diameter. (Plate XIII:b)	10 gm
Level 18	Spear fragment, broken and badly corroded. Lenticular in section, 9 mm at thickest point. (Plate XIII:d)	35 gm
M2		
Level 14	Blade or knife fragment? Lenticular in section, 2 mm thick. (Plate XIII:e)	6 gm
Level 14	Spear or knife fragment? Lenticular in section, 4 mm thick at midpoint. (Plate XIII:c)	7 gm
	DECORATIVE	
M1		
Level 15	Fragment bracelet, badly corroded. Flattened section, 3.5 mm thick. (Plate XIV:c)	5 gm
Level 20	Three fragments bracelet, badly corroded. Round in section: c. 8 mm, Inner diameter or bracelet approximately 68 mm (Plate XIV:a)	53 gm

Table 9.39 Unidentifiable Iron Objects

Provenience	Description	Weight
M1		
Level 1	1 large piece	14 gm
Level 1	3 fragments	15 gm
Level 1	1 fragment: 18.5 mm long, 7.4 mm wide, 5.2 mm thick.	2 gm
Level 1	small sphere: 4.1 mm, diameter	<1 gm
Level 3	badly corroded fragment "wire"; round in section, < 3 mm diameter.	
Level 5	3 fragments	6 gm
Level 8	4 fragments; also, 2 fragments "wire"	12 gm
Level 8	6 fragments "wire" <3 mm diameter	20 gm
Level 9	6 fragments	14 gm
Level 12	6 fragments	18 gm
Level 13	1 fragment	4 gm
Level 14	4 fragments	19 gm
Level 15	1 fragment flat blade? 1.3 mm thick	6 gm
Level 15	1 fragment bent object (Plate XIV:d)	2 gm
Level 15	6 fragments	30 gm
Level 17	5 fragments; also, 1 fragment "wire" 71 mm long, < 3 mm diameter	27 gm
House 6	5 fragments; also, 2 possible fishhooks	31 gm
Level 19	1 fragment	4 gm
Level 20	2 fragments; also, 2 fragments "wire" 100 mm; 61 mm long, < 3 mm diameter	29 gm
Level 22	5 fragments; also, 1 possible fishhook	30 gm
Level 23	5 fragments	27 gm
Level 24	6 fragments; also, 1 possible fishhook	18 gm
Level 25	2 fragments	7 gm
Level 27	3 fragments	6 gm
Level 29	2 fragments "wire"; 46 mm and 70 mm long; <3 mm diameter	13 gm
Level 30	7 fragments	40 gm

Provenience	Description	Weight
M2		
Level 1	1 fragment	2 gm
Level 2	4 fragments	16 gm
Level 2	5 fragments; also, 2 fragments "wire" 54 mm and 40 mm long; < 3 mm diameter	17 gm
Level 5	2 fragments	6 gm
Level 11	3 fragments	12 gm
Level 12	2 fragments	2 gm
Level 14	2 fragments	15 gm
Level 17	1 fragment	7 gm
Level 18	4 fragments	30 gm
JF1		
Level 3	6 fragments	16 gm
Level 4	4 fragments	18 gm
Level 6	14 fragments	39 gm

ARTIFACTS MADE ON ORGANIC MATERIALS

Wooden Knife Handle

A partially charred potion of what was most likely a knife handle was found in M2 Level 18 at a depth of 4.75 metres. The handle measured 11 centimetres in length. Its entire surface was covered with carefully incised geometric patterns, comprising predominantly parallel lines and cross-hatching (Plate X). The shaft had been longitudinally slit and broken prior to deposition and charring; the manner in which the knife blade had been hafted was clearly visible. A long, tapering point of metal had been pushed into the handle, presumably after being heated; the groove created in the process is still prominent.

Pendant Made on Epidermic Plate of Crocodile

A small, biconical hole had been drilled through a crocodile epidermic plate recovered from M2 Level 18 at a depth of 4.80 metres. The plate measured 31.8 mm by 29.3 mm and was presumably used as a pendant (App. II; Fig. 50).

Horn "Needle"

A long, tapering, pointed artifact 105.0 mm in length was found in M1 Level 15 (Plate X). The density and weight of the organic material on which the artifact was made suggest that it is horn. Numerous long, straight facets are clearly visible the length of the "needle", indicating that it was manufactured by parallel strokes of a knife. Possible functions of this artifact include use as a hair ornament, or for pottery decoration, or for net repair.

Artificially Modified Warthog Tusk

A tusk of Phaecochoerus aethiopicus which had been biconically perforated in two places was found in Level 23 of M1. The tusk measured 99.0 mm from end to end and weighed 37.8 gm. The perforations had been placed 11.3 mm apart approximately midway along the outer border of the tusk (App. II: Fig. 50). It is possible that the tusk was worn as a pendant.

CHAPTER 10

ORGANIC REMAINS

PLANT REMAINS

The recovery of botanical material was of major interest in the excavations at Jenne-jeno. Unfortunately, the highly compacted clays prevalent in the deposits made screening impractical. Equally unfortunately, systematic on-site flotation of soil was impossible as the only available water source was remnant pools on the floodplain which were choked with Echinochloa stagnina, Oryza barthii, and other graminaceous vegetation. As a compromise solution, it was decided to take back bags of soil periodically to the town for flotation. Additionally, soil samples were collected at the site whenever botanical material seemed to be present in a concentrated area of the deposits.

Soil and plant materials collected in this matter were examined by Professor J. R. Harlan of the University of Illinois at Urbana-Champaign. It is instructive to note that only six out of fourteen soil samples taken specifically because botanical material appeared to be present actually yielded plant remains upon examination. However, all of the flotation samples revealed botanical remains, although in several cases identification was not possible. This comparison highlights the necessity of devising a flotation device appropriate to the difficult field conditions at Jenne-jeno prior to undertaking further excavation.

Harlan's analysis indicated that the conspicuous plant materials in the samples were domesticated African rice (Oryza glaberrima), fox-tail millet (Setaria, probably S. pallidifusca), and common purslane (Portulaca, probably P. oleracea). Setaria is a common weed throughout West Africa which is characteristically found in quantity on heavy soils with impeded drainage (Rattray 1968: 39). Certain West African groups, for example for Mundang of Cameroon, are said to have cultivated S. pallidifusca in recent times (Porteres: personal communication reported in David 1976:250). Portulaca is an annual succulent herb which is cultivated in some countries as a vegetable (Uphof 1968). Throughout West Africa, the leaves of Portulaca are commonly eaten either raw or cooked (Busson 1972: 153). The recovery of seeds of the three plants (Oryza glaberrima, Setaria, Portulaca) from the bottom of intact pots at Jenne-jeno suggests that all three were economically useful to the inhabitants.

The occurrence of these three plant genera in the Jenne-jeno soil and flotation samples is recorded below in tabular form (Table 10.1). Of particular interest is a sample recovered from Level 24 in M1, which contained well-preserved chaff of Oryza glaberrima. A radiocarbon determination on charcoal taken from Level 24 yielded a date of a.d. 40 $\pm$ 50 making the associated rice the earliest thus far recovered from West Africa.

TABLE 10.1 Botanical Remains from Jenné-Jeno

	Phase I		Phase II		Phase III								Phase IV											
Unit, Level	Mnd 1, 30	Mnd 2, 18	Mnd 1, 29-27	Mnd 1, 26-25	Mnd 1, 24-23	Mnd 2, 17	JF 1, 6-5	Mnd 1, 22-21	JF 1, 4	Mnd 1, 20	Mnd 2, 16-15	JF 1, 3	Mnd 1, 19	Mnd 1,16	Mnd 1, Hs 6	Mnd 1, 15	Mnd 2, 14	Mnd 1, 18-17	Mnd 1, 14-13	JF 1, 2	JF 1, 1	Mnd 1, 12-11	Mnd 2, 13-12	Mnd 2, 11	Mnd 1, 10-9	Mnd 2, Hs 8/10	Mnd 2, 9-8	Mnd 2, Hs 7/7	Mnd 2, Hs 4/4	Mnd 1, 8	Mnd 2, 6	Mnd 2, 5/2	Mnd 1, 5	Mnd 2, Hs 3/3	Mnd 2, 1	Mnd 1, Hs 2/7-6	Mnd 1, 4-3	Mnd 1, 2-1
African Rice (Oryza glaberrima)					X								X			X		X	X	X		X							X			X				
Foxtail Millet (Setaria pallidifusca)																X				X		X										X					
Common Purslane (Portulaca oleracea)																			X										X			X					
Grass (Panicoid)	?	X			?																																
Unidentified	X	X										X				X		X																			

[probably contemporaneous

Excavated levels are arranged in most probable chronological order.

The identification of scraps of grass epidermis (Panicoid) from thin, ashy layers within level 30 of Mound 1 is also of interest.

FAUNAL REMAINS

Over fifteen kilograms of bone were recovered from the excavations at Jenne-jeno. While in the field, the faunal remains were divided into two groups: (1) potentially identifiable, very large bone fragments and diagnostic skeletal parts such as astragalus and articular portions of long bones; and (2) unidentifiable small fragments and undiagnostic skeletal elements such as rib and long bone shaft fragments. The latter group was weighed and discarded; the former was brought back for analysis. The weights of potentially identifiable bone (kept for analysis) and unidentifiable bone (discarded in the field) per excavated level are presented in Figure 10.1.

The faunal material retained for analysis was almost exclusively composed of mammal and fish. Prior to analysis, fish bone was separated from mammal bone and both groups were weighed. Figure 10.2 provides a comparison of the weight of these two faunal components for each excavated level.

Mammal Bone

The weight of the mammal bones recovered during excavation exceeded seven kilograms. One excavation unit, M1, provided over 75% of these remains. The mammalian fauna was examined briefly by Dr. B. M. Fagan, of the University of California at Santa Barbara. A more detailed analysis was carried out by Dr. R. J. Klein of the University of Chicago. The summary comments and table provided here are abstracted from Klein's report; detailed tables are presented in Appendix IV.

The highly fragmented condition of the bones, caused primarily by post-depositional decalcification, made identification impossible for the greater part of the material. For most of the bones which could be identified, precision greater than sub-Order or Class was not possible, particularly in the absence of a comparative collection. Most of the bones came from bovids of various sizes (Table 10.2); more precise identification was possible on bovid teeth, most of which belonged to a small bovine (either Bos taurus or Syncerus caffer—it was not possible to determine which) and reedbuck (Redunca redunca). Dentition from Taurotragus oryx (eland) and sheep/goat was tentatively recognized.

In terms of the animals which today inhabit the Ihland Niger Delta floodplain and adjacent upland areas, it seems likely that the four size classes of bovid post-cranial material recognized by Klein comprise at least some of the following species (based on geographical distributions in Dekeyser 1955):

LARGE:	Bos taurus, Syncerus caffer, Taurotragus oryx
LARGE MEDIUM:	Hippotragus equinus, Kobus defassa, Alcelaphus major
SMALL MEDIUM:	Redunca redunca, Ovis aries/Capra hircus, Tragelaphus sp., Damaliscus korrigum
SMALL:	Ourebia oribi

FIGURE 10.1 Total non-human bone: weight of potentially identifiable (black) and unidentifiable (diagonal shading) components

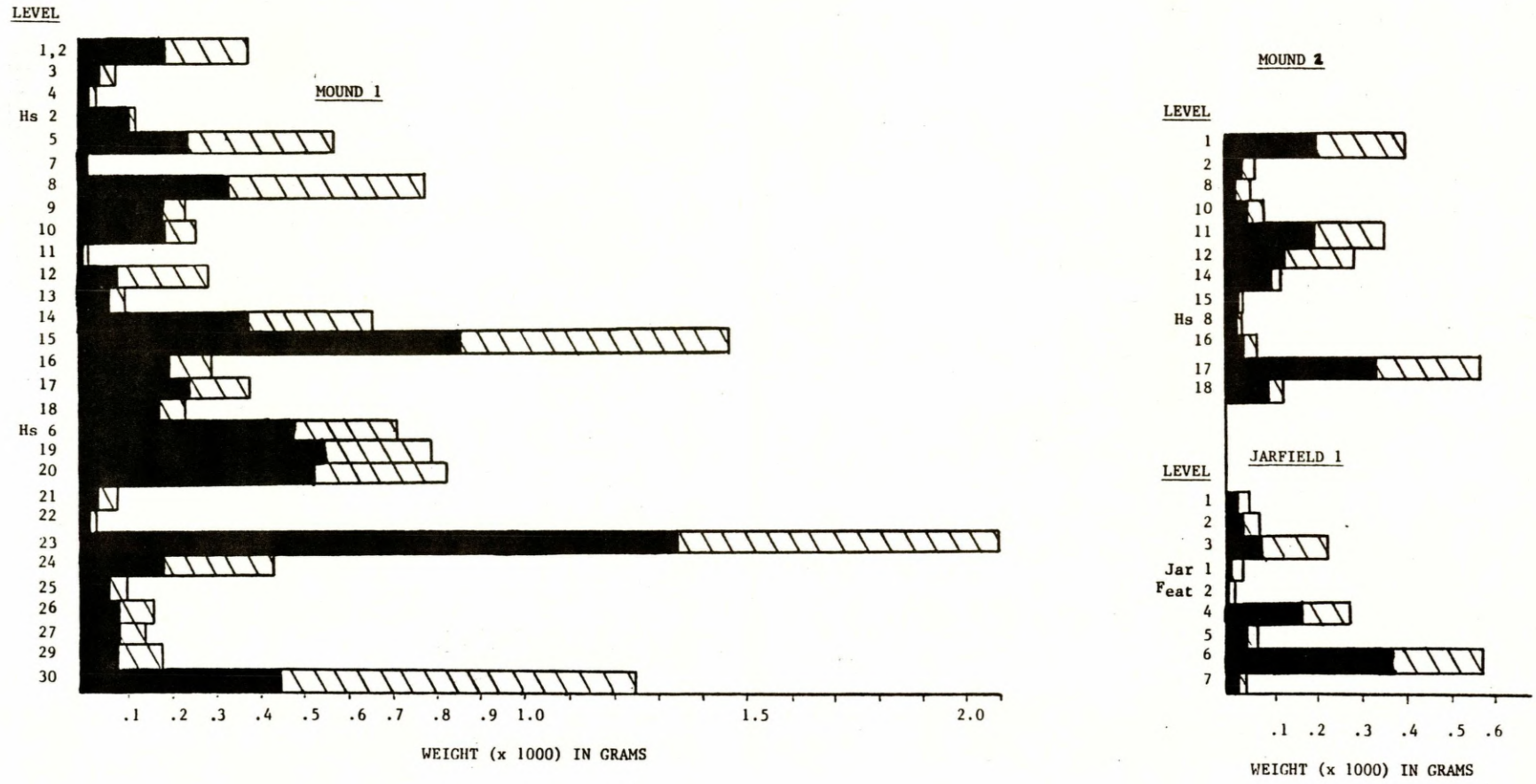
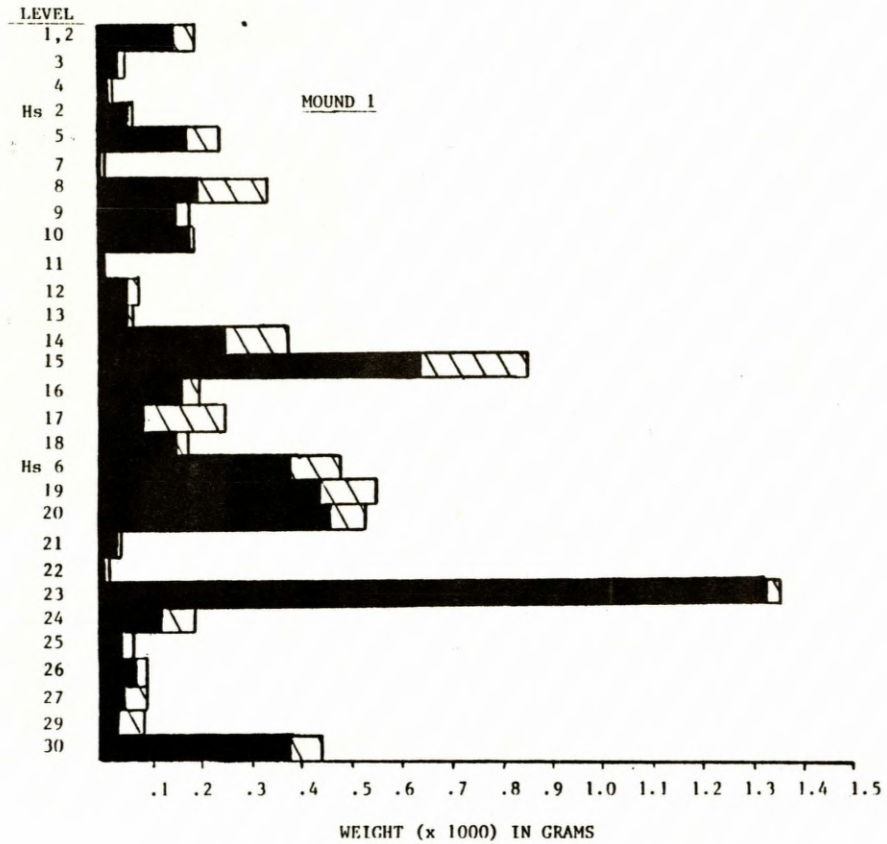
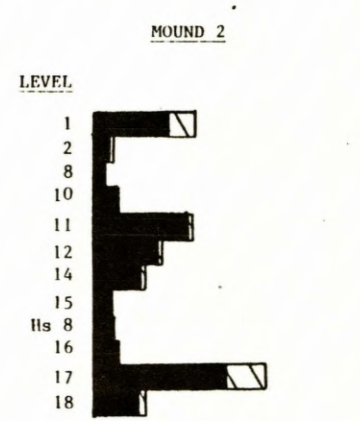


FIGURE 10.2 Identifiable bone: weight of mammal (black) and fish (diagonal shading) components





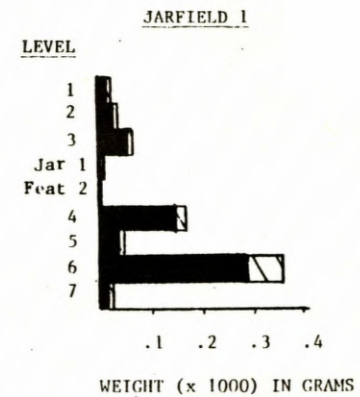


TABLE 10.2 Faunal Remains from Jenné-Jeno

	Phase I				Phase II					Phase III										Phase IV											
Unit, Level	[Mnd 1, 30	[Mnd 2, 18	Mnd 1, 29-27	Mnd 1, 26-25	Mnd 1, 24-23	Mnd 2, 17	JF 1, 6-5	Mnd 1, 22-21	JF 1, 4	[Mnd 1, 20	[Mnd 2, 16-15	JF 1, 3	Mnd 1, 19	Mnd 1, 16	Mnd 1, Hs 6	Mnd 1, 15	[Mnd 2, 14	Mnd 1, 18-17	Mnd 1, 14-13	JF 1, 2	JF 1, 1	[Mnd 1, 12-11	[Mnd 2, 13-12	Mnd 2, 11	Mnd 1, 10-9	Mnd 2, Hs 8/10	Mnd 2, 9-8	Mnd 2, Hs 7/7	Mnd 2, Hs 4/4	Mnd 1, 8	Mnd 2, 6	Mnd 2, 5/2	Mnd 1, 5	Mnd 2, Hs 3/3	Mnd 2, 1	Mnd 1, Hs 2/7-6	Mnd 1, 4-3	Mnd 1,2-1
Bovidae (genus unidentifiable)																																						
Small Bovidae (e.g. Ourebia oribi)										X		X																			X					X		
Small Medium Bovidae (e.g., Redunca redunca)	X		X	X	X	X	X	X	X	X			X	X	X	X	X	X	X					X							X		X	X	X		
Large Medium Bovidae (e.g., Hippotragus equinus)	X	X			X	X		X		X	X		X			X		X					X	X	X		X		X			X		X	X		
Large Bovidae (e.g., Bos taurus, Syncerus)	X	X			X	X	X			X				X	X	X			X			X			X	X			X			X				X	X
Bovidae (identifiable)																																						
Small Bovine (Bos taurus/Syncerus caffer)	X	X				X	X						X		X	X		X	X			X				X											
Eland (Taurotragus oryx)																						X																
Reedbuck (Redunca redunca)	X			X	X		X		X					X			X		X	X	X										X						
Caprine (Ovis aries/Capra hircus)																									X													
Warthog (Phacochoerus aethiopicus)					X																																	
Carnivora: Wildcat size																		X																				
Jackal size												X			X	X																X			X			
Viverridae																															X		X					
Common Genet (Genetta genetta)																															X							
Tortoise	X				X													X				X															X	
Bird	X							X								X			X											X				X		X	X

Excavated levels are arranged in most probable chronological order.

[probably contemporaneous

It should be pointed out, however, that Klein did not feel that his size categories were necessarily discrete with regard to material from any one species. For example, it is possible that small bovine post-cranial material was placed in both Large and Large Medium bovid size classes, and reduncine material may have been included in both Small Medium and Large Medium size classes.

Given the small sample size, the degree of bone fragmentation and accompanying low degree of precision in identification, it is impossible, on the basis of the material recovered during the 1977 excavations, to distinguish any temporal trends in subsistence strategies involving large mammals at Jenne-jeno.

Fish Bone

The fish bones recovered from Jenne-jeno were examined and identified by Dr. Gordon Howes of the Department of Zoology, British Museum. Various genera of catfish, including Clarias, Synodontis, and Auchenoglanis predominate. The Nile perch, Lates niloticus, is also well represented. The only other fish present appears to be Heterotis, although this identification is quite tentative.

Catfish and Nile perch are among the largest of the fish common to the Inland Niger Delta. Adult Clarias and Auchenoglanis can weigh between one and two kilograms (Daget 1954: 222, 263). Nile perch most frequently weigh in between one and eight kilograms, with catches exceeding a metre in length and weighing 20-40 kilograms on record (Daget 1954: 358). Although catfish and Nile perch make up a substantial part of the fish diet of peoples in Jenne today, their virtually exclusive representation at Jenne-jeno is undoubtedly a reflection of the survival rate of their sturdy bones. Small fish, often fried and eaten whole, stand little chance of archaeological preservation. Thus, the exploitation of the small, oil-rich Alestes which has been so vital to the Inland Niger Delta economy in recent historical times (Sundstrom 1972) may never be documented archaeologically. At the same time, it will be recalled that screening was abandoned at Jenne-jeno due to soil conditions, so the lack of small fish bones may equally well be the result of recovery bias.

With regard to the condition of the Jenne-jeno fish bone, Howes comments: "Some of the fragments have suffered charring and I was struck by the complete dislocation of the pectoral girdle fragments, as if they had been chopped".

Table 10.3 summarizes Dr. Howes' findings; his complete report is reproduced in Appendix IV.

ANALYSIS OF THE HUMAN SKELETAL REMAINS

The excavations at Jenne-jeno revealed twelve single burials, six of which were placed in urns, and one double interment in an urn. All skeletons were assigned numbers in the order in which they were discovered. Of the fourteen individuals exposed, no osteological remains could be recovered for skeletons 6 and 12 because of the completely disintegrated state of the bones. Information on the condition and burial context of all skeletal material from Jenne-jeno is presented in Table 10.4. The variety of burial attitudes represented is quite unusual, particularly since it appears from stratigraphic

TABLE 10.3 Fish Remains from Jenné-Jeno

	Unit, Level	Phase I				Phase II					Phase III												Phase IV											
		Mnd 1, 30	Mnd 2, 18	Mnd 1, 29-27	Mdn 1, 26-25	Mnd 1, 24-23	Mnd 2, 17	JF1, 6-5	Mnd 1, 22-21	JF 1, 4	Mnd 1, 20	Mnd 2, 16-15	JF 1, 3	Mnd 1, 19	Mnd 1, 16	Mnd 1, Hs 6	Mnd 1, 15	Mnd 2, 14	Mnd 1, 18-17	Mnd 1, 14-13	JF 1, 2	JF 1, 1	Mnd 1, 12-11	Mnd 2, 13-12	Mnd 2, 11	Mnd 1, 10-9	Mnd 2, Hs 8/10	Mnd 2, 9-8	Mnd 2, Hs 7/7	Mnd 2, Hs 4/4	Mnd 1, 8	Mnd 2, 6	Mnd 2, 5/2	Mnd 1, 5	Mnd 2, Hs 3/3	Mnd 2, 1	Mnd 1, Hs 2/7-6	Mnd 1, 4-3	Mnd 1, 2-1
Catfish Clarias		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X		X		X					X		X		X	X	X
Synodontis				X	X		X							X	X		X		X	X			X		X					X		X		X	X	X
Auchenoglanis											X			X		X																					
Siluroid			X						X			X					X			X			X		X										X		
Nile Perch (Lates niloticus)		X		X	X	X	X	X	X	X				X		X	X	X	X	X	X		X	X		X				X		X		X	X	X
Heterotis																																		X				

[probably contemporaneous

Excavated levels are arranged in most probable chronological order

TABLE 10.4 Burial Context and Condition of Human Remains from Jenné-jeno

SKELETON	PIT	URN or INHUME	BURIAL ATTITUDE	CONDITION OF BONE
1	JF1	I	Disarticulated; long bones grouped together, cranial framgments scattered. Disturbed by burial of Jar 1.	fair
2	JF1	U	Disarticulated; teeth and cranial fragments lying in urn sherds. Disturbed by burial of Jar 5.	poor
3	JF1	I	Articulated, extended inhumation. Oriented E-W, Facing N. Tibiae disturbed by burial of Skeleton 5.	fair to good
4	JF1	I	Articulated, tightly flexed inhumation, oriented NW-SE, facing E.	fair/ good
5	JF1	I	Articulated, loosely flexed inhumation, oriented NW-SE, facing S.	very poor
6	JF1	U#1	Disarticulated; very fragmentary, powdery bone.	very poor
7	JF1	U#6	Disarticulated; fragmentary bone, disturbed by later interment of Skeleton 8.	poor
8	JF1	U#6	Partially articulated	fair
9	JF1	U#5	Disarticulated; fragmentary bone, apparent breakage of bones prior to interment.	fair
10	JF1	U#7	Disarticulated; fragmentary boned.	poor
11	JF1	U#8	Almost fully articulated.	excellent
12	M2	I	Articulated, extended inhumation, oriented N-S.	very poor
13	M2	I	Articulated, flexed inhumation with hands under chin, oriented N-S, facing W.	very poor
14	M1	U#12	Disarticulated; highly fragmentary	very poor

data that both urn and inhumation burial were practiced contemporaneously. The possibility that burial treatment reflected sex or age distinctions was immediately investigated. Tables 10.5 and 10.6 present the data used in the determination of age and sex wherever sufficient remains permitted. Table 10.7 indicates that burial attitude cannot be correlated with any obvious categories of age or sex. If the variation in burial treatment does reflect some other aspect of social patterning at Jenne-jeno (and it would be unwarranted to assume that it necessarily must do so), ethnic and/or racial diversity must be considered as a possible variable. Within the town of Jenne and its immediate environs today, six ethnic groups live in close proximity and bury their dead in a single, vast Muslim cemetery.

The possibility of ethnic heterogeneity at Jenne-jeno enormously complicates the analysis of skeletal remains. Osteological analysis is optimally carried out by comparison with a well-known population. Not only do we lack so much as one analysis of any population, living or dead, from the Inland Niger Delta, but, far from securing initial data on a discrete population at Jenne-jeno, we may be dealing with skeletons from two or more ethnic/racial groups. In such a case, data on tooth wear like that set forth in Table 10.8 may more reliably reflect cultural differences in diet and use of the teeth as tools than attrition due to age (see Molnar 1970, 1972).

Determination of sex is equally problematic when the sample may include skeletons from more than one population. Particularly when diagnostic elements of the ossa coxae are not present, one is obliged to base sex determination on more subjective anatomical criteria. Commonly, it is necessary to assess the largeness or smallness or the ruggedness of features on the skull when the range of those characteristics in the population is unknown. No studies have ever been undertaken on sexual dimorphism in populations in the Inland Niger Delta; personal observation, however, led the author to conclude that several cranial traits commonly considered diagnostic of sex (see Krogman 1962: 115 and Keen 1950: 65-79) should not be used in evaluating skeletal remains from this region. For example, parietal and frontal eminences were especially marked among Fulani men living in Jenne today, but Fulani women generally did not display these traits. Textbooks, however, teach that large frontal and parietal eminences are a female characteristic.

Similarly, the size of supra-orbital ridges, as well as size and shape of the eye orbits, may vary more between populations than between the sexes of one population. Along these lines, Huinziga's anthropometric study of the Dogon* is of interest, for his results showed surprisingly little sexual dimorphism among the population measured. Huinziga states, "...as far as general body measurements are concerned, Dogon females are almost 'harmoniously reduced males' " (Huinziga and Birnie-Tellier 1966: 686). A number of indices and measurements were compared for 84 male and 48 female Dogons in this study, including stature, cephalic index, crista height, arm length, biacromial breadth, pelvic breadth, facial index, (sellion-gnathion distance), and nasal index. A clearly bimodal distribution, indicating sexual dimorphism, was

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* The Dogon inhabit the Bandiagara escarpment, located 150 kilometres northeast of Jenne.

TABLE 10.5 Aging Criteria and Results of Analysis

SKEL.	AGE	TEETH	CRANIAL SUTURES	EPIPHYSEAL CLOSURE and PUBIC SYMPHYSIS
1	17-22 yrs.	wear on molar series (see Table 10.8)	saqit. suture unfused endocranially	distal femoral epiphysis fused
2	23-30 yrs.	wear on molar series		
***3	20-25 yrs.	wear on molar series	lambdoid. unfused endocranially	medial articular surface of clavicle billowed
4	30+? yrs.	wear and tooth loss	incomplete ectocran. fusion of all sutures	
5	25-32 yrs.	wear on molar series		
***7	18-20 yrs.	recently erupted M_3		humeral + femur heads incompletely fused. Billowed artic. surfaces on unfused element of corpus sterni
8	25-35 yrs.	wear on molar series	wormian bones unfused endocranially	
***9	20-24 yrs.	recently erupted M_3		Pubic symphysis - Stage II or III (Todd)
10	20-25 yrs.	wear on molar series		
***11	45-55 yrs.	wear and tooth loss	all sutures fused ectocran. except wormian	Pubic symphysis - Stage IX (Todd)
13	18-25 yrs.	wear on molar series		
***14	16-24 mos.	unerupted deciduous molars; partially calcified permanent dentition		

***=high confidence in age estimate

TABLE 10.6 Sexing Criteria and Results of Analysis

trait	criteria			skeleton number												
	♂	♂	♀	1	2	3	4	5	7	8	9	10	11	13	14	
POSTCRANIAL																
Subpubic angle	1-sm	2-med	3-lg								1		1			
Obturator foramen	1-lg ○		3-sm △										1			
Sciatic notch	1-25-60°	2-60-65°	3-65-90°	3		3				1	1	3	1			
Preauricular sulcus	1-sm	2-med	3-deep						2	1	1		1			
Vertical diam. femur head						46.1 mm			47.1 mm	49.1 mm	48.2 mm		47.9 mm			
Femur Length						470-475 mm		450 mm					476 mm			
CRANIAL																
Supraorbital ridges	1-lg	2-med	3-sm	3		2	1	3					2			
Mastoid process	1-lg	2-med	3-sm			3	1	2	3	1		3	2			
Occipital lines	1-lg	2-med	3-sm				1			1		1	1			
Frontal eminences	1-sm	2-med	3-lg			2	1	2					3			
Orbits	1-rd. marg.	2-med	3-shrp. marg.			3	3	3					1			
Lower M_1	1-5 cusp		3-4 cusp	3		3		3	3	1		3				3
Mandibular symphysis ht.				34mm		36mm	37mm					37mm	38mm			
			RESULTS	♀ ***		♀ **	♂ **	♀ *	♀	♂ ***	♂ **	♀ ***	♂ ***			

Confidence Level - ***=high

TABLE 10.7 Correlation of Burial Type with Age and Sex

INHUMATIONS

Skeleton #	3	4	5
Sex	F	M	F
Age	20-25	30+	25-32

URN BURIALS

Skeleton #	7	8	9	10	11	14
Sex	F	M	M	F	M	?
Age	18-20	25-35	20-24	20-25	45-55	infant

TABLE 10.8 Attrition on Molar Series Used in Age Estimation

Skeleton	M1	M2	M3		Age
1				M3 recently erupted	17-22 years
2					23-30 years
3					20-25 years
4	Most molars lost pre-mortem. Moderate wear on premolars.				30+? years
5					25-32 years
7				M3 recently erupted	18-20 years
8					25-35 years
9	Only one recently-erupted M3 recovered				20-24 years
10					20-25 years
11	All molars lost pre-mortem				45-55 years
13					18-25 years
14	1 deciduous M1 - erupted 4 deciduous M2 - unerupted 2 permanent M1 - 3/4 calcified				16-24 months

KEY



enamel polishing
exposed dentine

method adapted from:
Brothwell 1965:69 and
Miles 1963:204

obtained for only one set of measurements—stature. Huinziga suggests that this tendency towards converging morphology may reflect the adaptive advantage of certain 'shapes' (e.g., cranial morphology) which are selected for in both males and females, particularly in populations inhabiting extreme environments. These results may be pertinent to any study of a population which has undergone long-term adaptation to the parched Sahel environment of the Inland Niger Delta.

The reliability of sexually diagnostic traits involving the rugosity of muscle attachments, especially on the occipital bone, is seriously diminished for groups in which women routinely bear heavy burdens (up to 100 lbs.) on their heads. This certainly is the case today in Jenne, where the family's daily water and wood fuel supply is transported considerable distances on the heads of female family members.

With all the above caveats in mind, S.K.M. attempted to sex nine of the twelve burials from which osteological remains were recovered. As indicated in Table 10.6, the nature and quality of relevant data were sufficient in only four cases to permit a high degree of confidence in the sex determination.

Age at death could be assigned with a high degree of confidence in five cases; the remaining estimates are based primarily on the highly variable criteria of dental attrition (see Table 10.8) and fusion of cranial sutures.

Very few pathological conditions or physical anomalies were noted (Table 10.9). No healed fractures were found, and very few dental caries were in evidence. Premortem tooth loss was high in only two individuals, one of whom (no. 11) was certainly quite old at death. The remaining teeth of Skeleton 11 exhibit calculus deposits extending in a deep V pattern toward the tooth roots, indicating that premortem tooth loss may have resulted from gingivitis with subsequent development of periodontitis. Evidence of periodontal disease is marked in the mandible of Skeleton 4, where all molars were lost before death, and the left horizontal ramus shows considerable thickening, probably as the result of alveolar infection (osteitis). The mandible of Skeleton 4 was anomalous in that it was assymmetrical; the left horizontal ramus (measuring from gnathion to gonion) was 92.3 mm long, while the right ramus measured 85.8 mm. It is possible that occlusal problems associated with this anomaly may have contributed to the large amount of premortem tooth loss and periodontal disease in an individual who does not appear to have been very advanced in age, judging by the small amount of attrition on his canines and pre-molars. It might be noted here that Skeleton 4 also exhibits an interesting pattern of excessive wear on the right lateral and medial lower incisors, possibly because of some use of these teeth as tools, such as the drawing of reed or raffia through the teeth. The wear on the lower right incisors is matched by a notch worn away on the upper right lateral and medial incisors.

Evidence of osteoarthritis was found only in Skeleton 11, where lipping in varying degrees was noted on vertebrae, the knee joint, elbow, wrist, and metatarsals.

The limited excavation sample from Jenne-jeno does not provide evidence of traumatic injury resulting in fractures or of enamel hypoplasia associated

TABLE 10.9
Pathological Conditions and Anomalies

Skeleton 1 - Large septal aperture on right humerus.

Skeleton 3 - Pronounced gonial eversion.

Skeleton 4 - Extensive pre-mortem tooth loss (mandible: left M1 and M2 alveoli totally resorbed, M3 alveolus partially resorbed; right M2 alveolus completely resorbed, M1 partially resorbed, M3 recent pre-mortem loss). Upper and lower right incisors have notched wear pattern. Asymmetrical horizontal rami of mandible.

Skeleton 8 - Small carious lesion - upper M3. Wormian bones.

Skeleton 10 - Lower left I2 lost pre-mortem.

Skeleton 11 - Caries: small lesion on upper left I1. Pre-mortem tooth loss: total alveolar resorption of lower left M3 and M2 and lower right M3 and M2. Partial resorption of upper left M3, and lower right M1. Recent premortem loss of lower left M2 and PM2. Wormian bones. Above and slightly to the right of glabella is a small (1 cm x 0.4 cm) healed bone lesion, suggesting a blow to the frontal with a sharp object sometime substantially prior to death. Two small (2-3 mm diam.) atrophic spots in supraspinous fossa of scapula. Osteoarthritic lipping: heavy on 5th lumbar; moderate on sacroiliac joint, odontoid artic. facet, and 4th lumbar; slight on lower thoracic vertebrae, 2nd and 3rd lumbars, medial condyle of left femur, medial border of capitulum (humerus) posterior margin of both distal radial articular surfaces, trochlear notch of ulna, and proximal artic. facets of 1st, 2nd and 3rd metatarsals.

with disease or nutritional stress. Since most of the individuals in the sample died before the age of 30, however, it would be incorrect to pronounce them a healthy group. Today, the region is plagued by a host of diseases whose vectors thrive in the sluggish waters of the Niger. Schistosomiasis, filariasis, and malaria all contribute to low life expectancy for peoples living in the Inland Niger Delta. The improvement of the water supply has reduced the incidence of cholera, hepatitis, and dysentery, but older inhabitants of Jenne today can still remember when epidemics struck every few years and newborn infants died "by the dozen" from tetanus contracted when the umbilical cord was cut. The majority of these diseases were not recent introductions in the course of European expansion and must be considered as a major cause of the low life expectancy suggested by the Jenne-jeno sample.

CHAPTER 11

SUMMARY OF THE OCCUPATION PHASES DEFINED AT JENNE-JENO

PHASE I - c. 250 B.C. - A.D. 50 (M1 Levels 30-25; M2 Level 18)

The earliest phase of occupation at Jenne-jeno is defined by the absence of any evidence for mud architecture; in M1, these early levels are capped by level 24 (beginning Phase II) which appears to be composed mainly of collapsed mud wall material and has produced a radiocarbon date of a.d. 40 ± 50. The major stratigraphic component of Phase I is a thick, homogeneous layer of very dark clay containing substantial amounts of dispersed charcoal, ash, and pottery. The interface between this level and sterile floodplain alluvium was reached in both M1 and M2 at a depth of approximately five metres. Charcoal taken from the upper half of this early occupation level (M1 Level 30) was dated to 210 ± 180 b.c. A conservative interpretation of this date is that the first phase of occupation at Jenne-jeno began around or somewhat earlier than 200 B.C. and continued until c. A.D. 50. During this time, the minimum linear extent of the site was 110 metres (the distance between M1 and M2), but settlement did not extend as far as JF1, where no Phase I deposits or cultural material was encountered.

The economy during this early phase can be only partially reconstructed due to the high degree of post-depositional fragmentation of bone as well as to sampling factors. Bones of catfish and Nile perch are common in Phase I deposits, but the majority of the faunal material comes from bovids of various sizes, of which only the reedbuck, Redunca redunca, could be definitely identified. A small bovine—most likely Bos taurus (R. G. Klein 1978: personal communication) or possibly Syncerus caffer (African buffalo)—was also present. Additionally, remains of crocodile, tortoise, and bird were noted. Despite the consistent presence of domesticated rice in most levels from Phase II on, no evidence of rice or any other cereal remains was recovered from Phase II. The possibility of sampling error looms large, however.

Iron and slag were present in quantity in the earliest levels. No Phase I burials were found, nor was there any evidence of permanent mud architecture. Thin ash lenses of Panicoid grass in M1 Level 30 may possibly be the remains of burned grass huts. Alternatively, these ash lenses may be the result of small grass fires used to smoke fish in the manner still employed by the Bozo of the region today.

Phase I pottery is characterized by simple unrestricted and simple restricted rim shapes (60%) and a marked preference for twine-impressed decoration (70-80% of all sherds) and red slip (present on 50-70% of all Phase I rim sherds). Almost half of the sherds studied were made from a fine-textured, sand-tempered paste. Paint decoration in white, magenta,

and red is present but rare. The post-firing application of yellow paste over the surface of a pot is comparatively popular in Level 30. Plastic decoration is also uncommon, appearing on less than 15% of all Phase I sherds.

PHASE II - c. A.D. 50 - 400 (M1 Levels 24-21; M2 Level 17; JF1 Levels 6-4)

The lower boundary of Phase II is provided by a level of mud-wall collapse in one of the central excavation units; a substantial sample of well-preserved chaff from Oryza glaberrima was taken from this same level. Associated charcoal yielded a date of a.d. 40 ± 50. This is the earliest archaeological occurrence of African rice yet known. Other economic elements show a great deal of continuity with Phase I; faunal remains are still dominated by fish and bovids. Two clay animal figurines closely resembling those made today by Fulani pastoralists for their children provide an additional hint that the small bovine present may be Bos taurus rather than Syncerus caffer. Similar figurines were found at Karkarichinkat (Smith 1974) and Daima (Connah 1976), made by Late Stone Age pastoralists/collectors. Two other radiocarbon dates come from Phase II deposits: a.d. 290 ± 150 (M1 Level 23), and a.d. 380 ± 110 (M2 interface of Levels 16 and 17), which is taken as the upper boundary of Phase II.

Phase II deposits are present in all three major excavation units (M1, M2, and JF1), separated by a maximum distance of 400 metres. Again, this may be considered to be the minimum linear extent of the site at that time. This apparent increase in site size by early Phase II may possibly be correlated with the appearance of permanent mud architecture and domesticated rice at the beginning of the phase. On the other hand, their seemingly simultaneous appearance may merely be an artifact of an extremely small excavation sample. Only further excavation can resolve this question. Also to be clarified by future excavation is the rate of physical expansion of Jenne-jeno in Phase I and the areal extent of the mound at the beginning of Phase II. Based on present evidence, however, it is probable that Jenne-jeno was a site of considerable dimensions, possibly measuring a half-kilometre or more along her main axis, by A.D. 200.

The pottery of Phase II is very similar to that of Phase I, although fine-textured and sand-tempered wares become progressively less common, and interior slip on pots increases rapidly in popularity by the end of the phase. Over 50% of the rims are simple, and twine decoration (particularly "fishnet" weave) is still the usual mode of decoration. As before, paint decoration is present, through rare, and grooves or some other form of plastic decoration can be found on up to 20% of all sherds.

Presently enigmatic, but of potentially great significance, are two finds recovered from JF1 Level 6: a pale blue, finely-made glass bead, and a chipped pottery disc weighing 7.0 grams that may have functioned as a measure of weight. If this interpretation is correct, both finds imply the existence of trade in the early first centuries A.D., although the direction and scale of this trade is unknown.

The stratigraphic position of Funerary Urns 9, 8, and 7 indicates that JF1 was first used as a cemetery in late Phase II.

PHASE III - c. A.D. 400 - 900 (M1 Levels 20-13; M2 Levels 16-14; JF1 Levels 3-1)

Early Phase III deposits in both M1 and M2 appear to have been created contemporaneously by one depositional process. It is not known what process would result in fairly even deposition of a thick, homogeneous layer of consolidated loam over an area at least 110 metres wide (the distance between M1 and M2), but the identical texture and appearance of M1 Level 20 and M2 Level 15, as well as the virtually identical frequencies of various pottery classes and attributes, suggest that both levels are the result of the same depositional event. Judging from the radiocarbon dates, both levels may have been laid down within a period of one hundred years: M1 Level 16 is dated to a.d. 520 ± 170 (mid-Phase III) and it will be recalled that M1 Level 23 (mid-Phase II) was dated to a.d. 290 ± 150. This period of accumulation is followed in M1 by the lengthy occupation of House 6, which is ultimately destroyed at the end of the phase. A number of wall stumps and house floors are visible in section; they are undoutedly related to various building and rebuilding epidodes of House 6, which appears to have been continuously inhabited for a considerable period of time, perhaps as much as several hundred years. Phase III architectural techniques are illustrated by the curvilinear tauf wall of House 6. The absence of compacted wall collapse debris around the tauf wall indicates that at least part of the superstructure may have been constructed of organic materials such as reed or grass. The uppermost level (Level 13) associated with House 6 contained a great deal of ash and charcoal; it is quite possible that the occupation of House 6 finally came to an end as fire consumed the thatch or mat superstructure. M2 seems to have been relatively free of occupation during much of the period of House 6 occupancy. There is some evidence that the area of M2 was experiencing active erosion at this time.

The Phase III subsistence economy continues to be based on rice, fish, and bovids. Wild plants are represented, for the first time, by Setaria pallidifusca (foxtail millet) and Portulaca oleracea (common purslane) recovered from the bottom of intact pots in Phase III deposits. Owing to sampling considerations, however, their economic significance cannot be evaluated at this time.

The iron retrieved from Phase III deposits was in better condition than that from earlier phases. It was possible to identify among the iron artifacts a projectile point, two knife blades, four fishhooks, and a bracelet. Several fragments of copper were also found. Other finds of interest from Phase III include a number of small, fired clay zoomorphic and anthropomorphic figurines, a bone awl (?), a cornaline bead, several fired clay "spoons", and a sandstone grinding stone. Phase III pottery is dominated by vessels with restricted rims. Carinated forms in particular rise substantially in popularity. The most characteristic type of Phase III pottery is the well-made carinated bowl, slipped dark orange/red on the interior and rim, with groove and paint decoration above the carination and twine decoration below it. These bowls are frequently found in association with burials in JF1 or are used, inverted, as covers for funerary urns. This funerary function is not exclusive however; several fire-blackened carinated bowls were recovered from hearth areas of M1 and M2 where they clearly had been used as cooking pots.

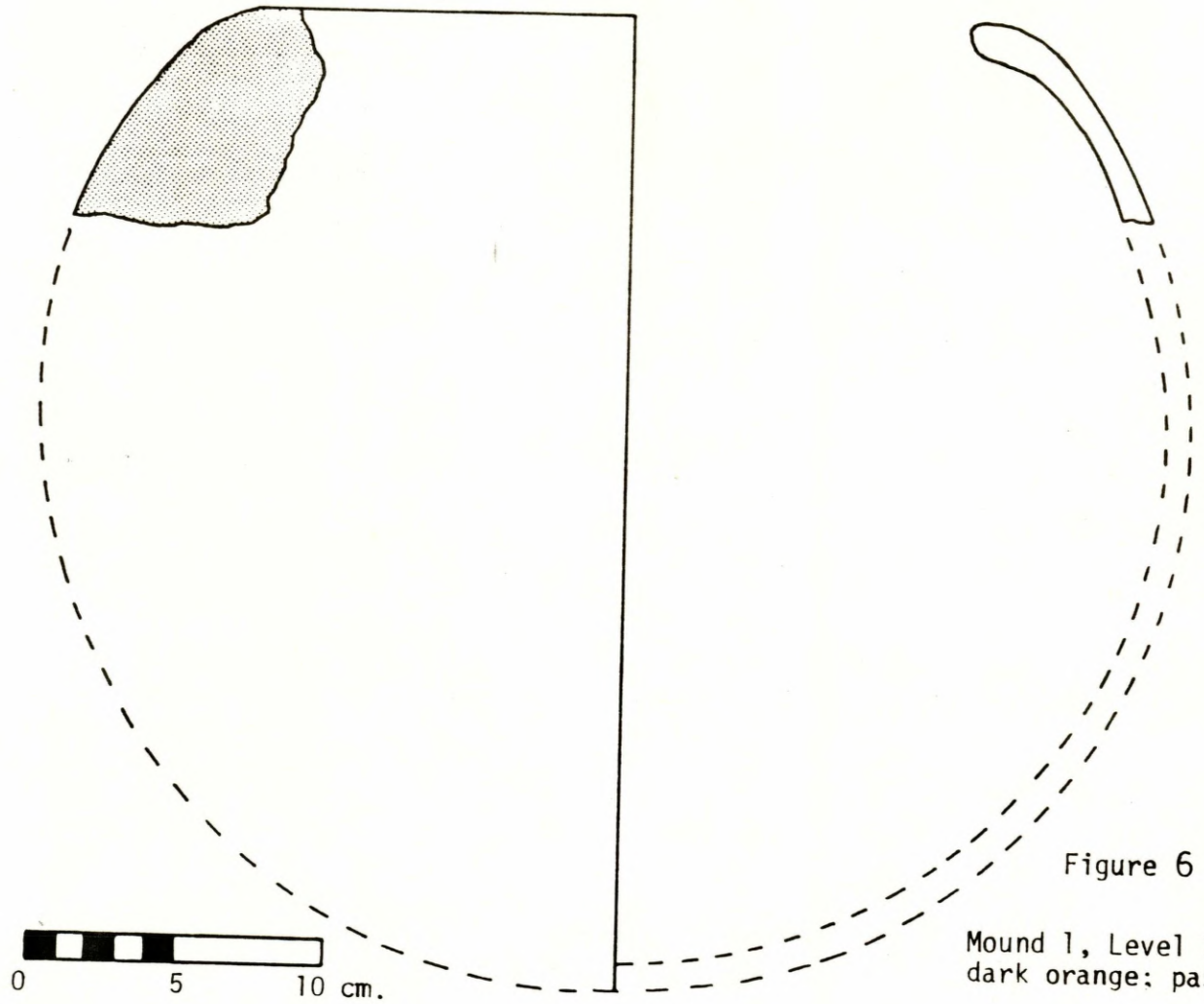


Figure 6 Restricted Simple Rim

Mound 1, Level 3; rim - 18; color - dark orange; paste - medium with grog.

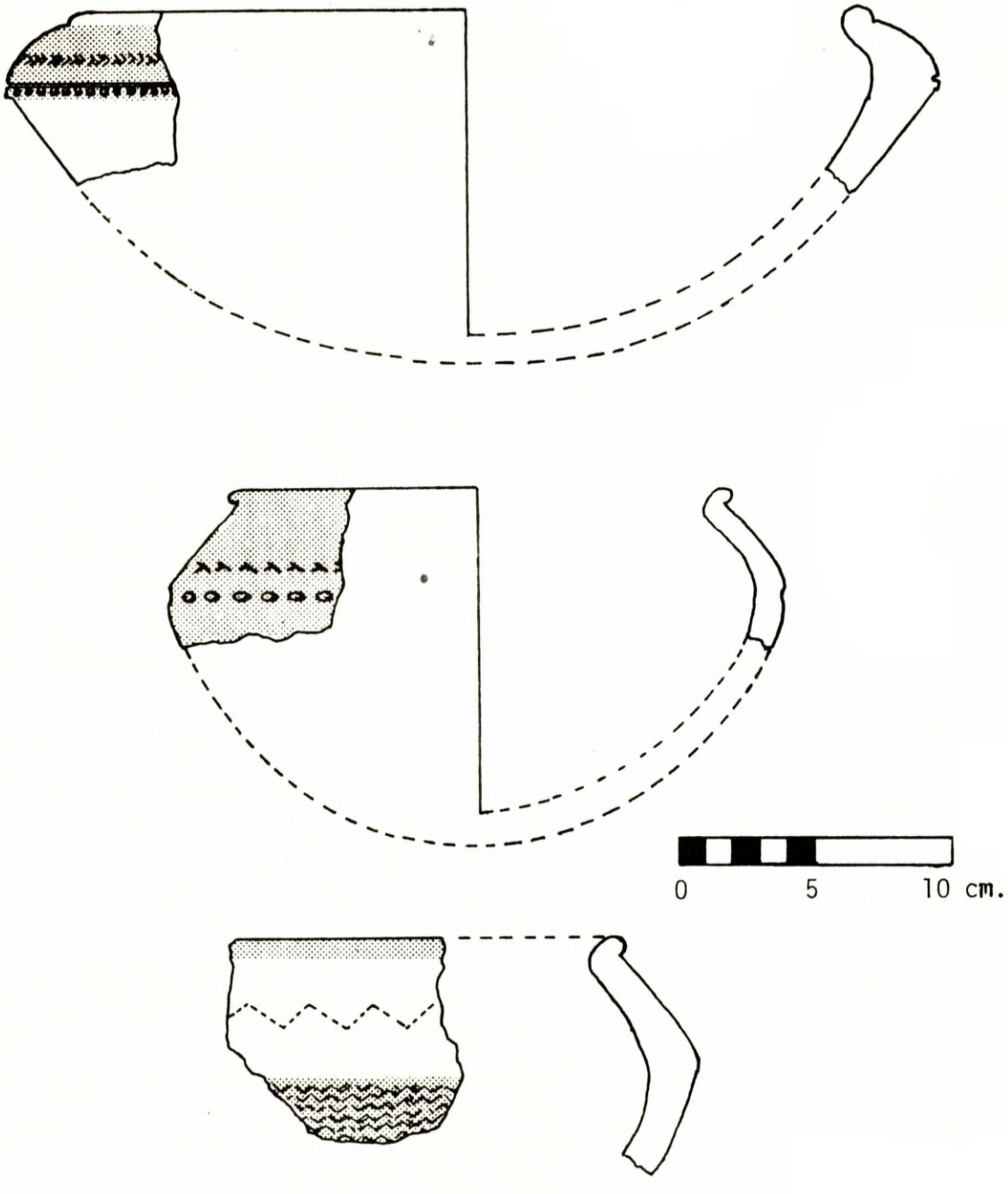


Figure 7 Restricted Carinated Rim

Top: Mound 1, Level 9; rim type - 23; paste - medium with grog; color - dark orange. Middle: Mound 1, Level 8; rim - 11; paste - medium with grog; color - dark orange. Bottom: Mound 1, Level 8; rim - 11; paste - medium with grog; color - dark orange; dark red/orange inner slip.

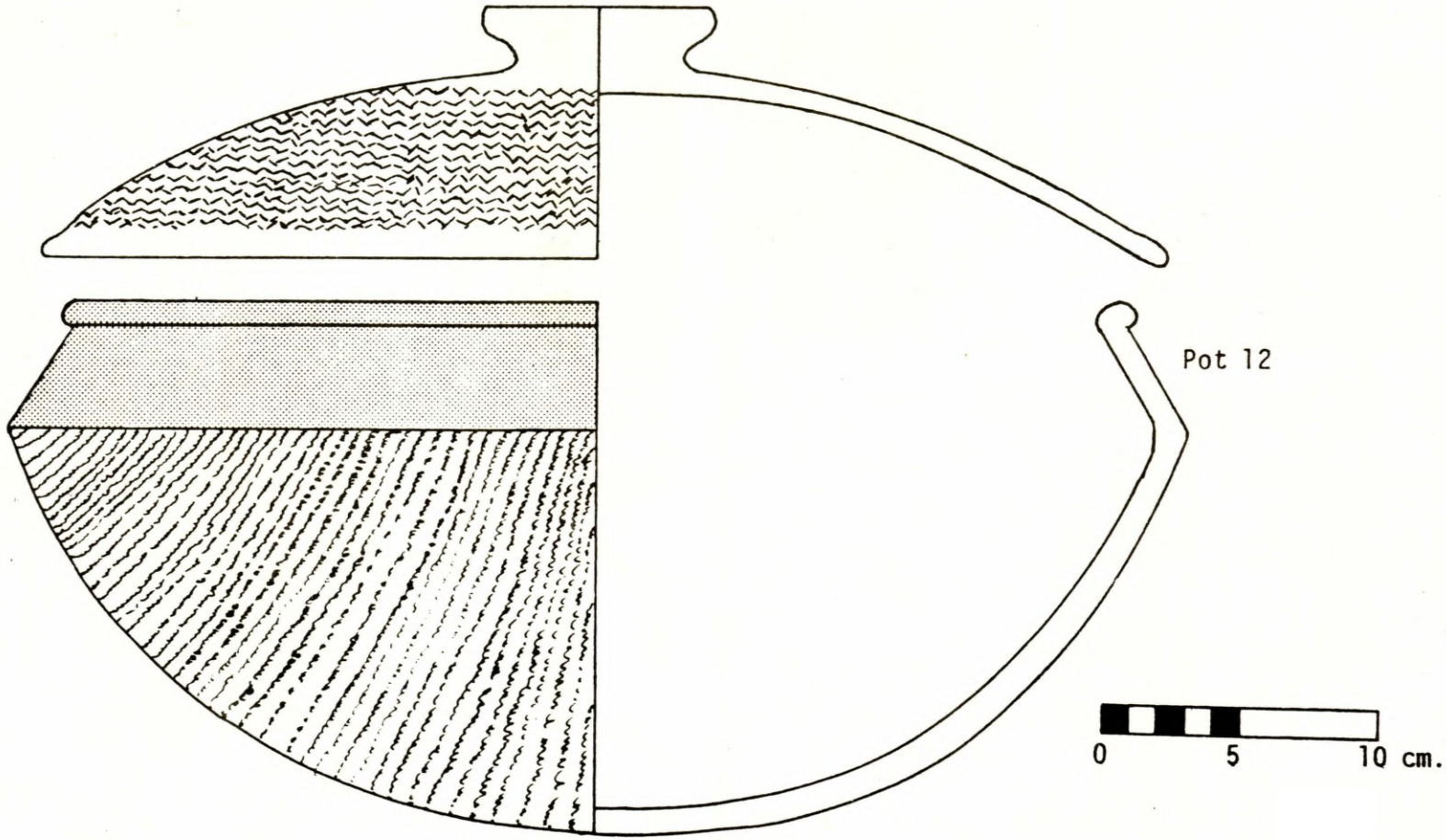


Figure 8 Restricted Carinated Pot with Potlid (Unrestricted Non-vessel)

Found together in Mound 1, Level 16; Potlid: rim type - 18; paste - medium with grog; color - light orange. Carinated pot: rim - 11; paste - medium with grog; color - light orange; fire-blackened exterior; dark red/orange inner slip.

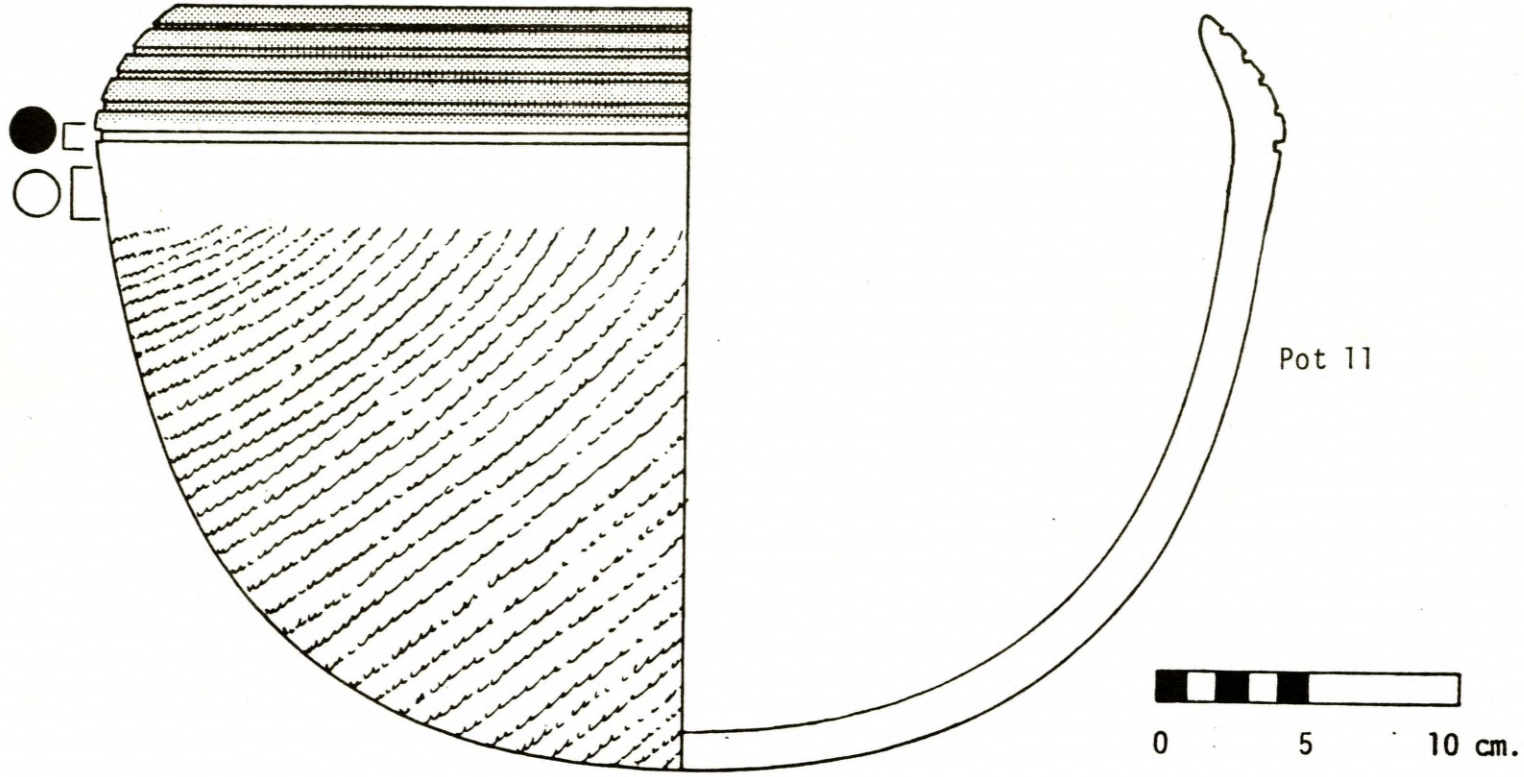


Figure 9 Restricted Carinated Pot

Found in Mound 1, Level 14 covered by broken potlid; rim type - 14; paste - medium with grog; color - light orange; dark red/orange inner slip.

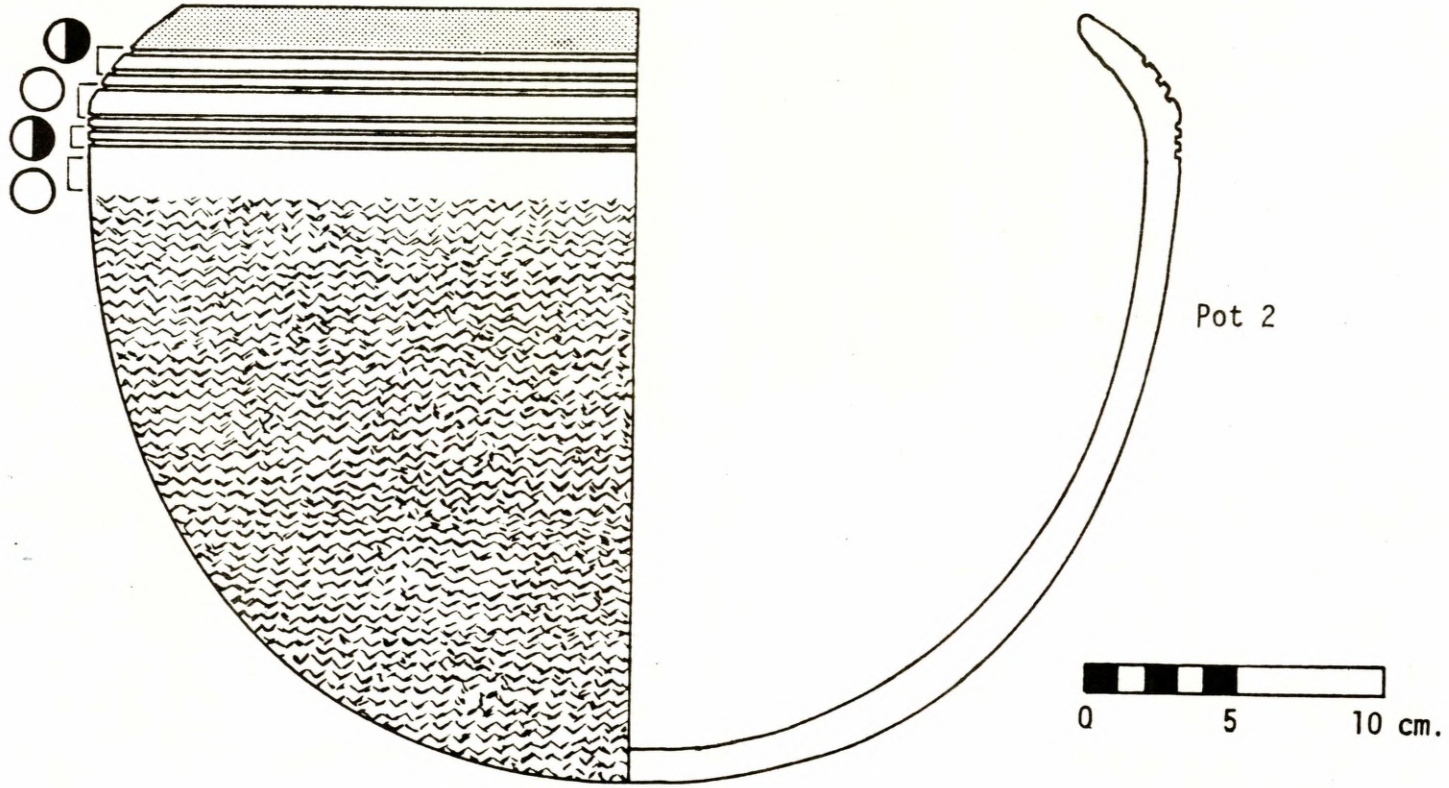


Figure 10 Restricted Carinated Pot

Found in Jarfield 1, Level 1; rim - 14; paste - medium with grog; color - dark orange; dark red/orange inner slip; inside the pot was a broken potlid.

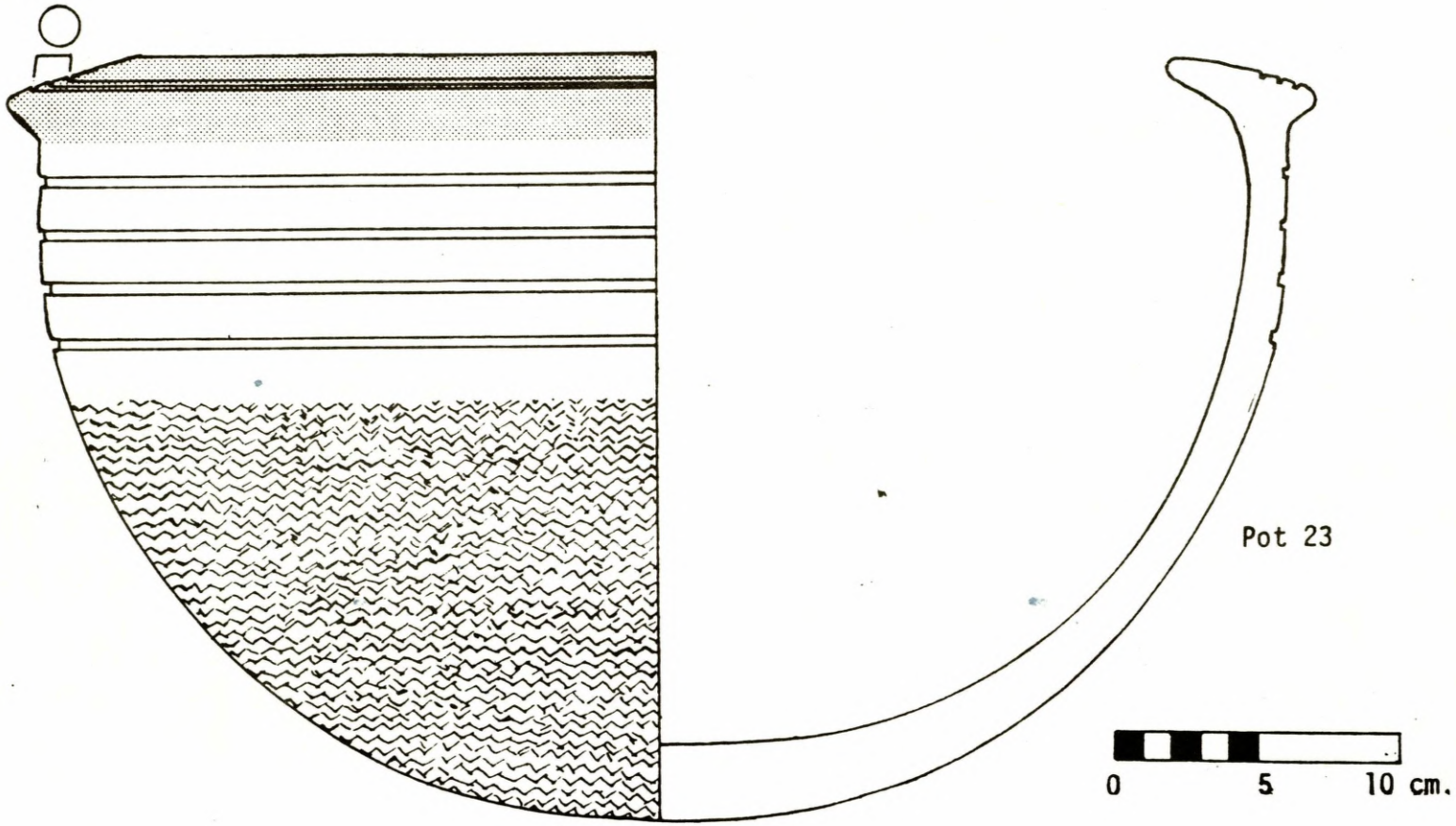
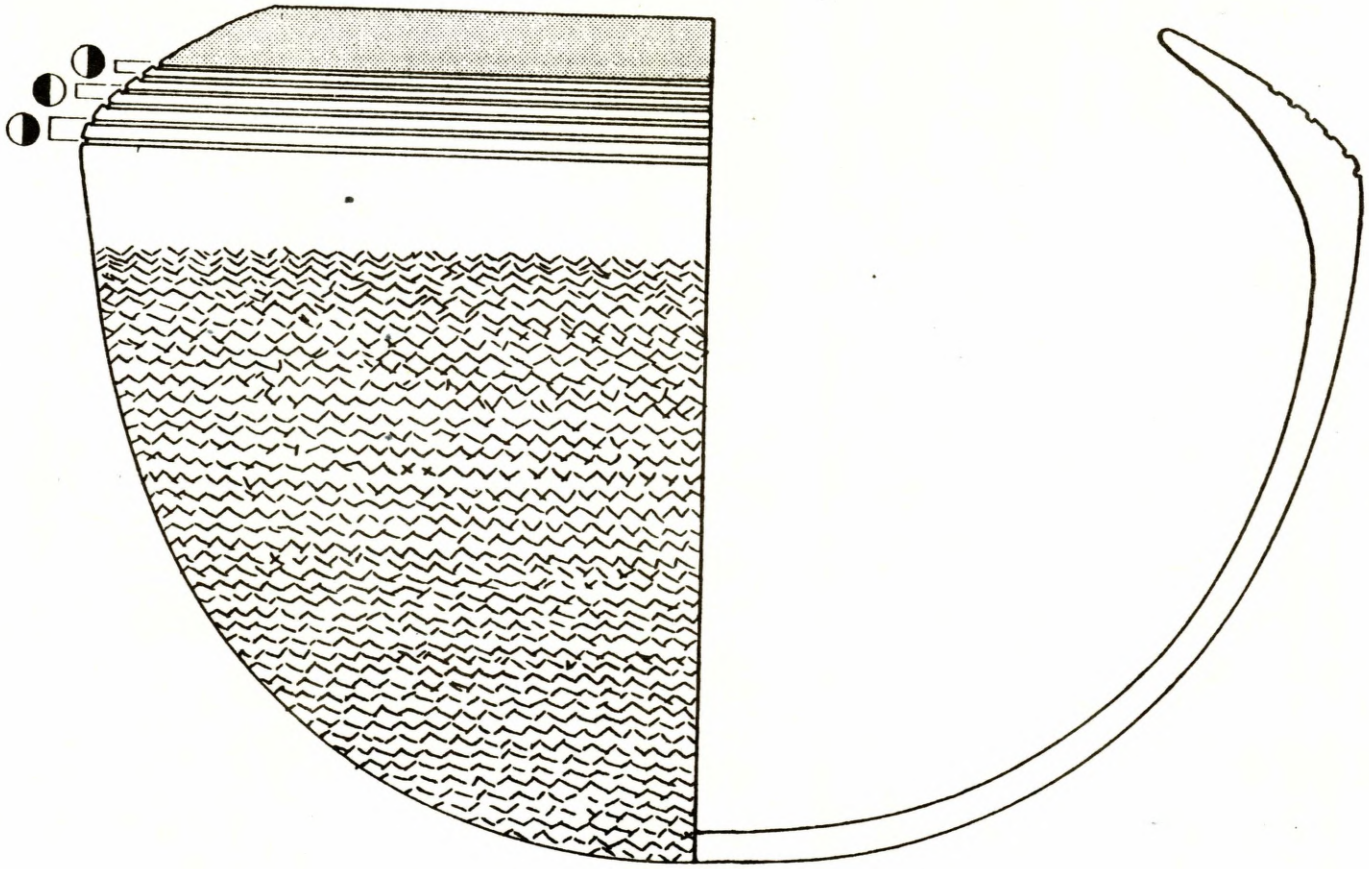


Figure 11 Restricted Carinated Pot

Mound 2, Level 12; rim type - 7; paste - medium with grog; color - light orange; fire-blackened on exterior; dark red/orange slip on interior.



0 5 10 cm.

Figure 12 Restricted Carinated Pot

Found inverted and broken on top of funerary urn #6 in Jarfield 1; rim - 14; paste - medium with grog; color - dark orange; dark red/orange inner slip.

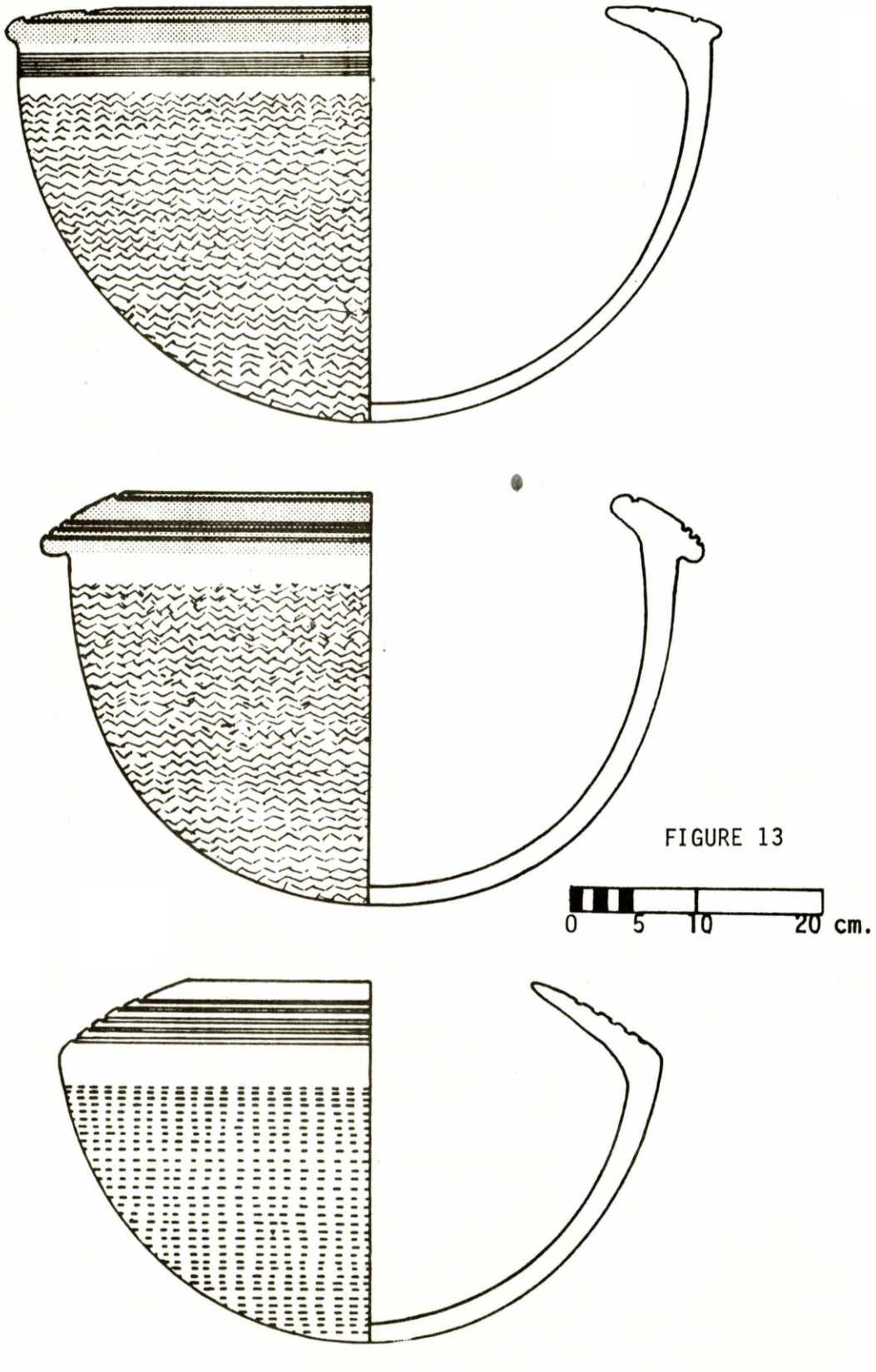


FIGURE 13

Figure 13 Restricted Carinated Pots

Top: found in Jarfield 1 on top of funerary urn #8; rim - 7; paste - coarse with grog; color - dark orange; fire-blackened on exterior; dark red/orange slip on interior.

Middle: found in Jarfield 1 inverted on top of funerary urn #5; rim - 7; paste - medium with grog; color - dark orange; dark red/orange slip on interior.

Bottom: found smashed inside funerary urn #7; rim - 14; paste - medium with grog; color - dark orange; dark red/orange inner slip.

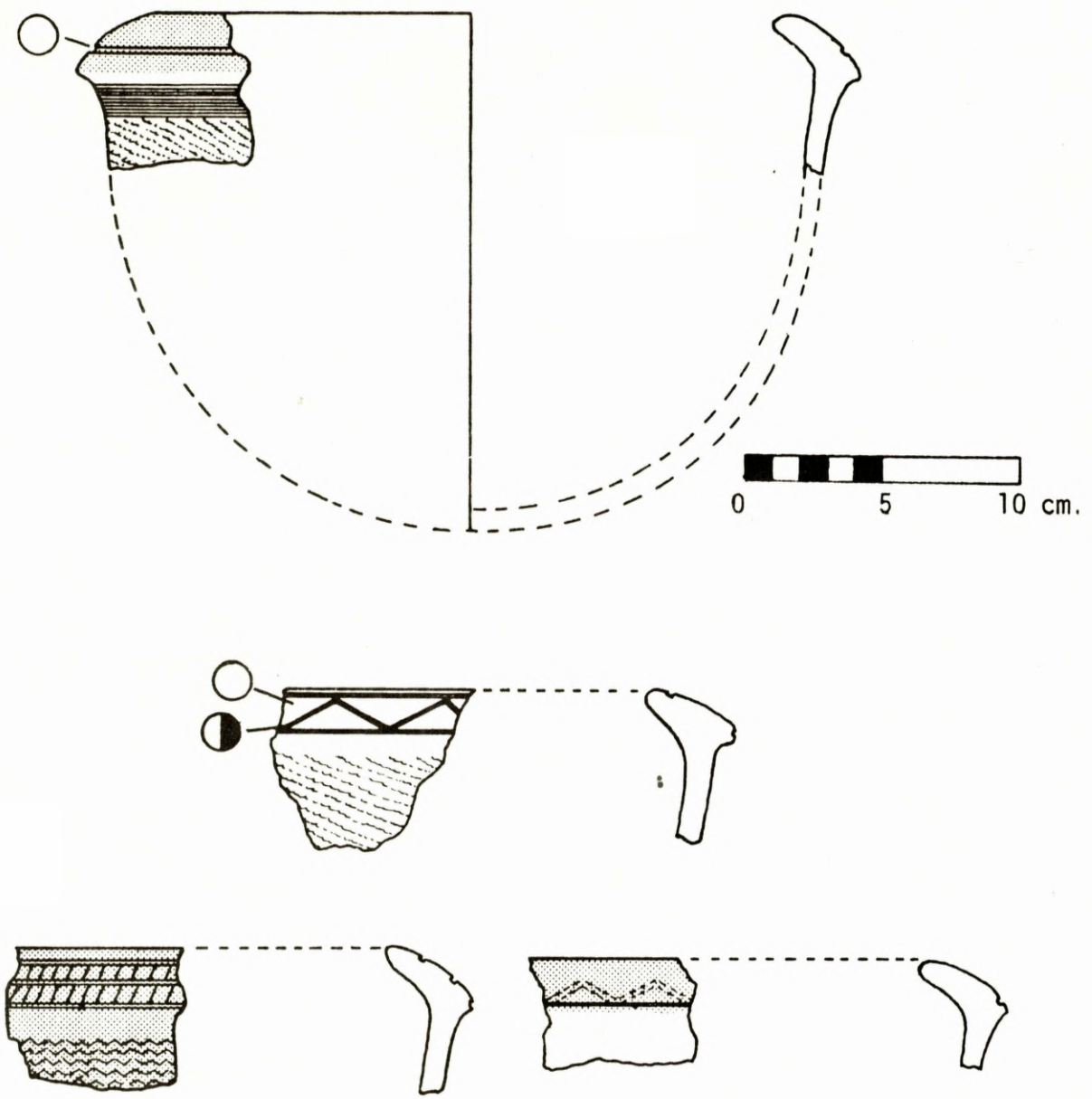


Figure 14 Restricted Carinated Rim

Top: Mound 1, Level 20; rim - 7; paste - medium with grog; color - dark orange; dark red/orange inner slip. Middle: Mound 1, Level 1; rim - 7; paste - medium with grog; color- light orange; dark red/orange inner slip. Bottom left: Mound 1, Level 8; paste - medium with grog; color - dark orange; dark red/orange inner slip. Bottom right: Mound 1, Level 3; rim - 7; paste - medium with grog; color - dark orange; dark red/orange inner slip.

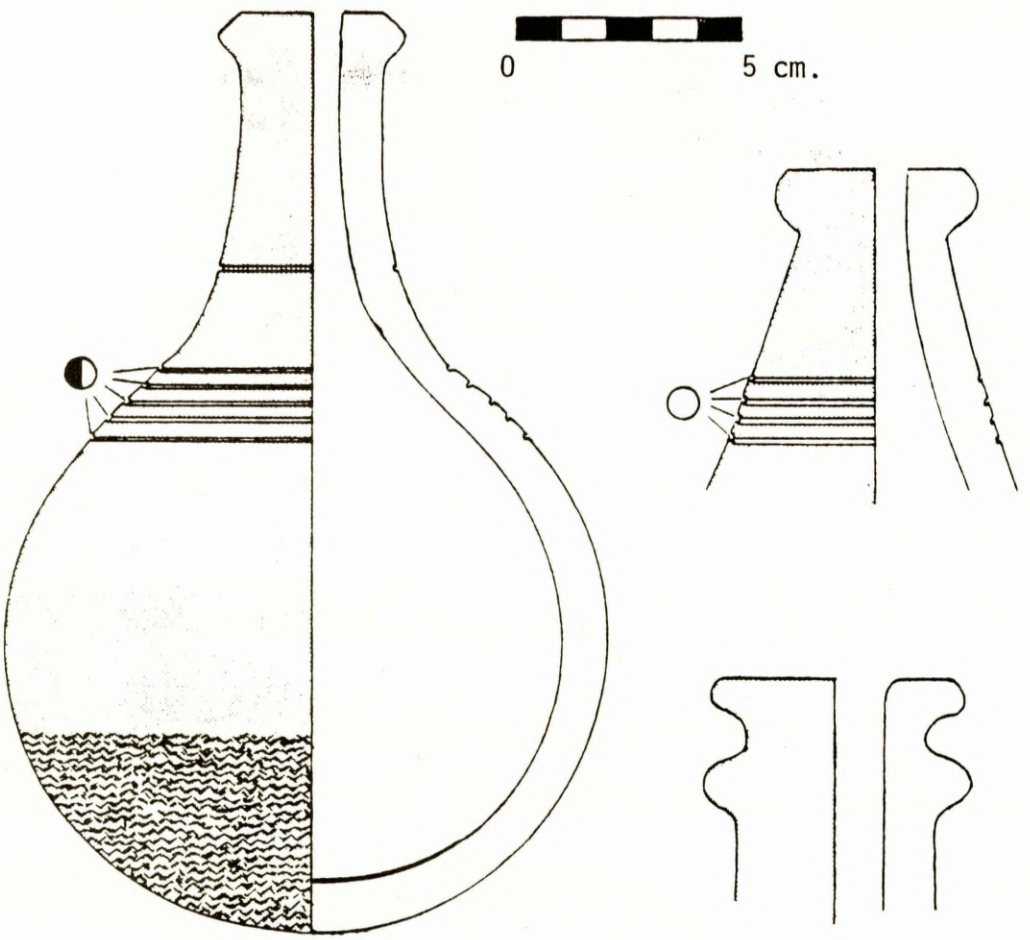


Figure 15 Restricted Long Necked Rim - Bottles

Left: found broken inside funerary urn #7 in Jarfield 1; rim - 32; paste - medium with grog; color - light orange. Right top: Mound 1, Level 16; paste - medium with grog; color - dark orange. Right bottom: Mound 1, Level 12; paste - medium with grog; color - light orange.

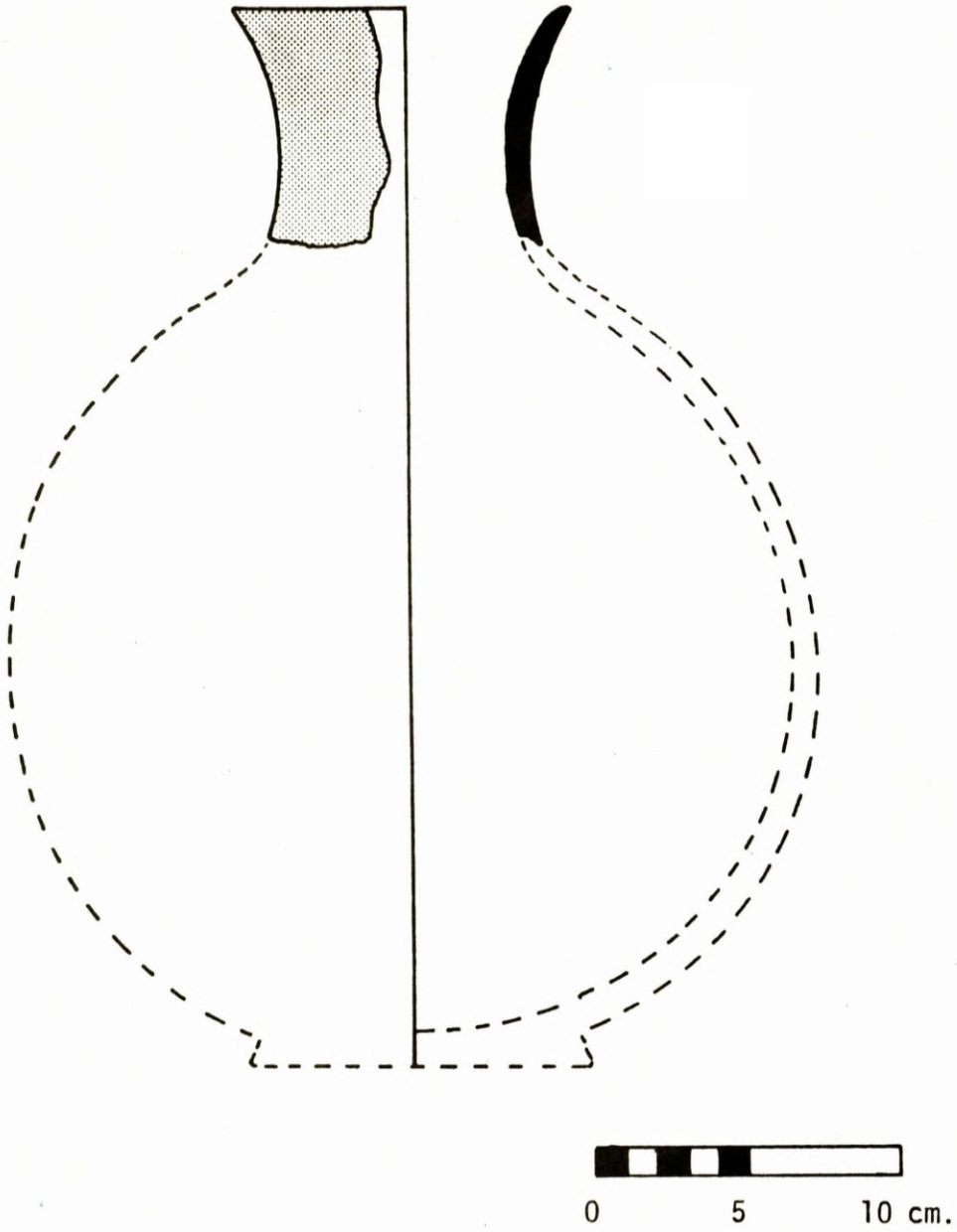
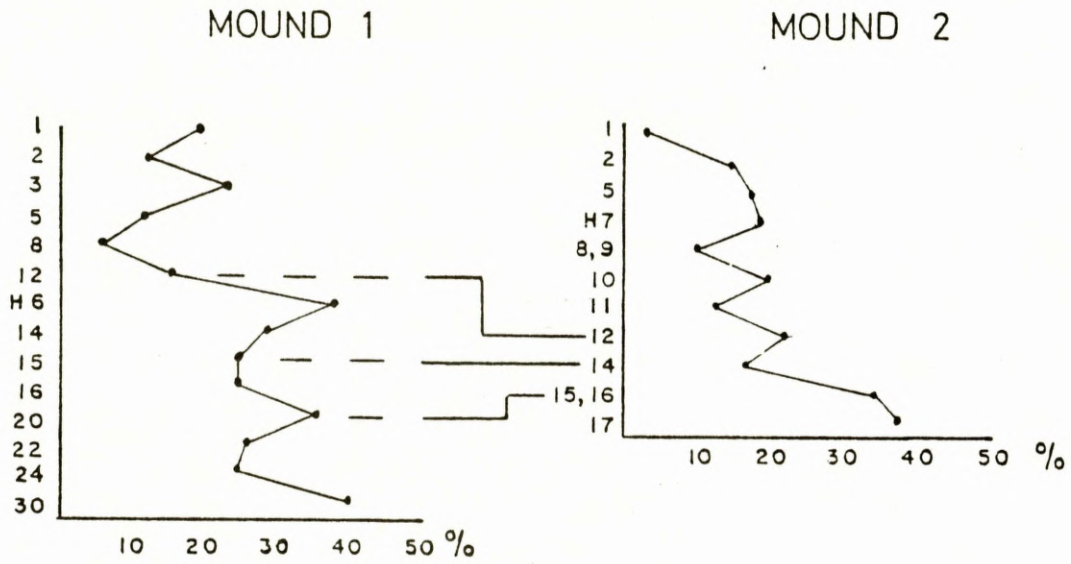
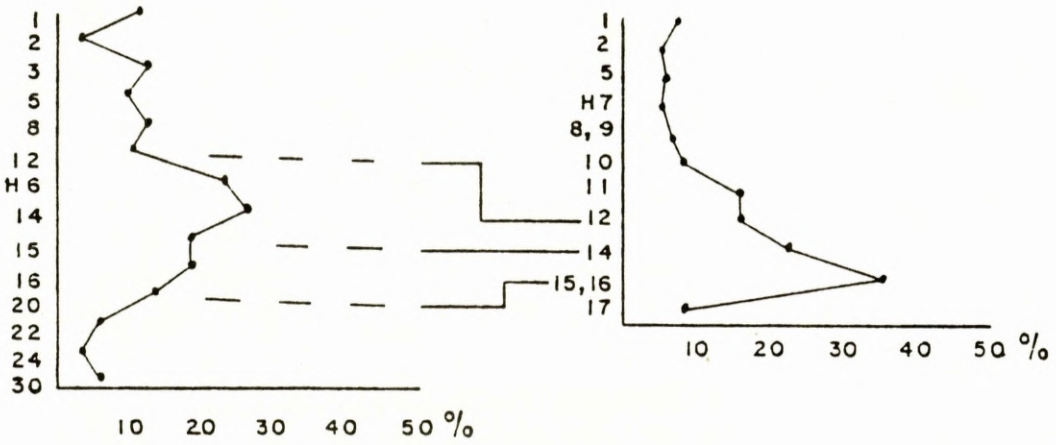


Figure 16 Restricted Long Necked Rim - Bottles

Mound 1, Level 26; rim type - 32; paste - medium with grog; color - buff; outer slip is light orange.

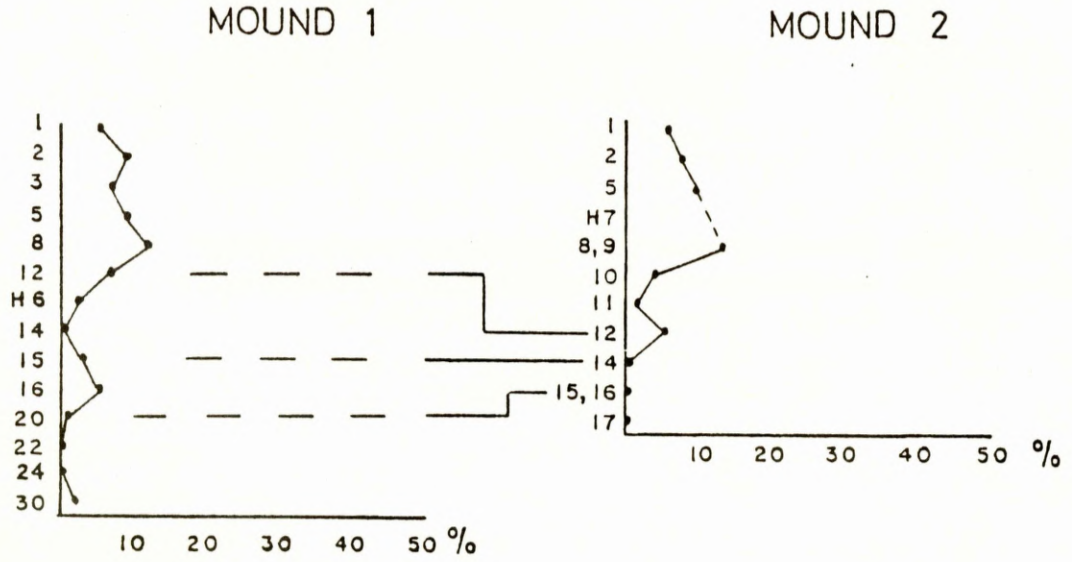


Simple Restricted Rims

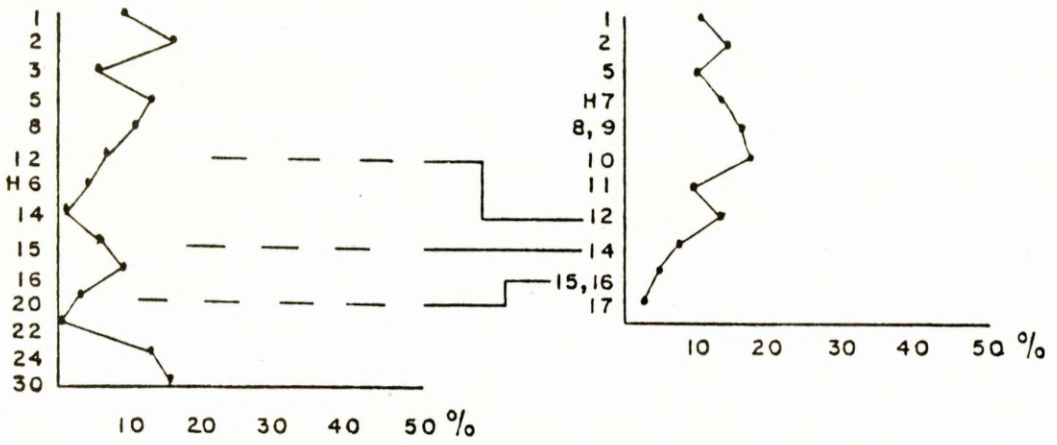


Carinated Forms

Figure 34 Frequency of rim shapes through time expressed as percent of rim sherds per level (for levels where total rim sherds > 30).



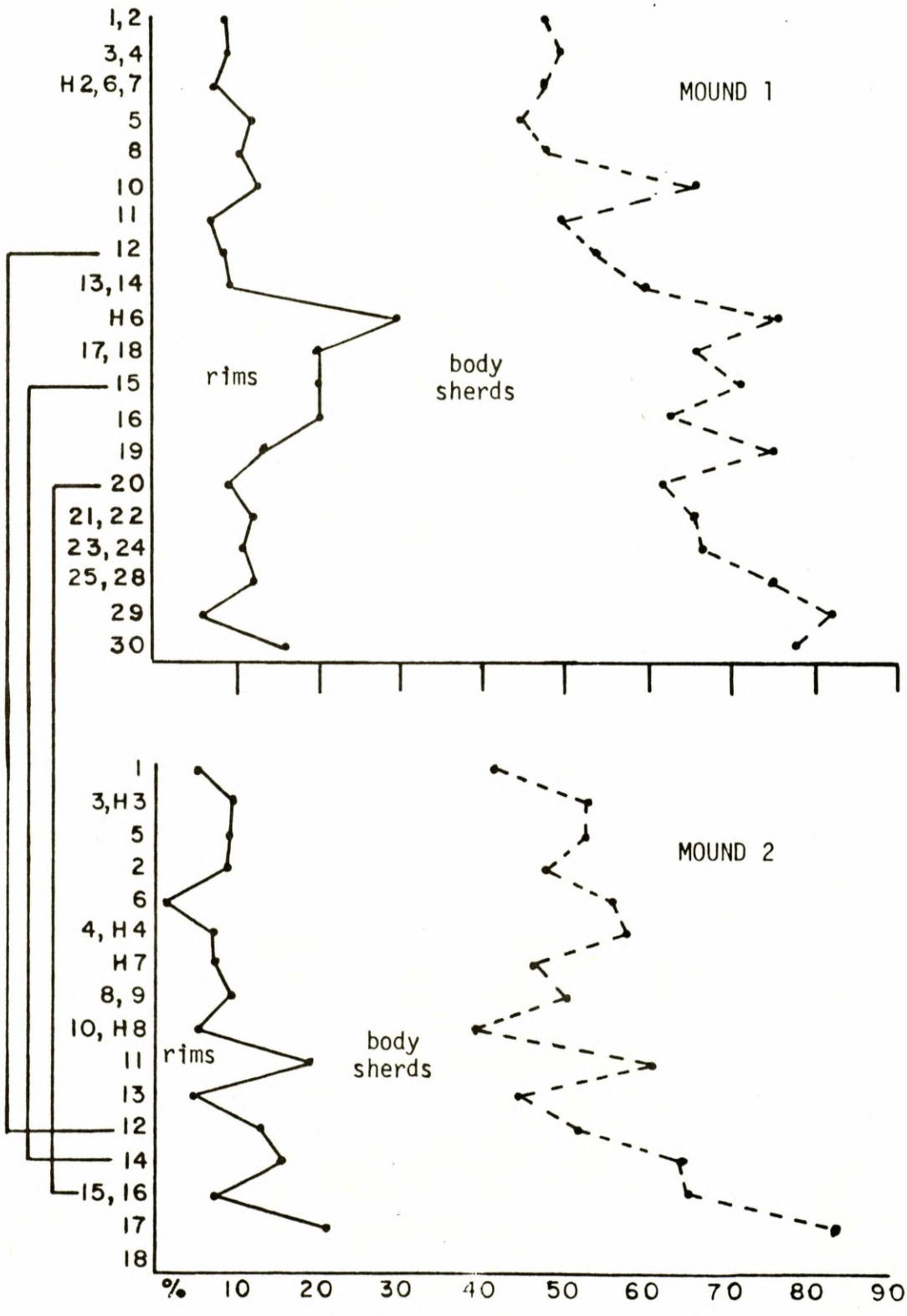
T-rims (and variants)



Everted Rim

Figure 35 Frequency of rim shapes through time expressed a percent of rim sherds per level (for levels where total rim sherds > 30).

Figure 36 Cumulative graph of twine decorated rim (——) and body (---) sherd frequencies expressed as percent of rim + body sherds per level.



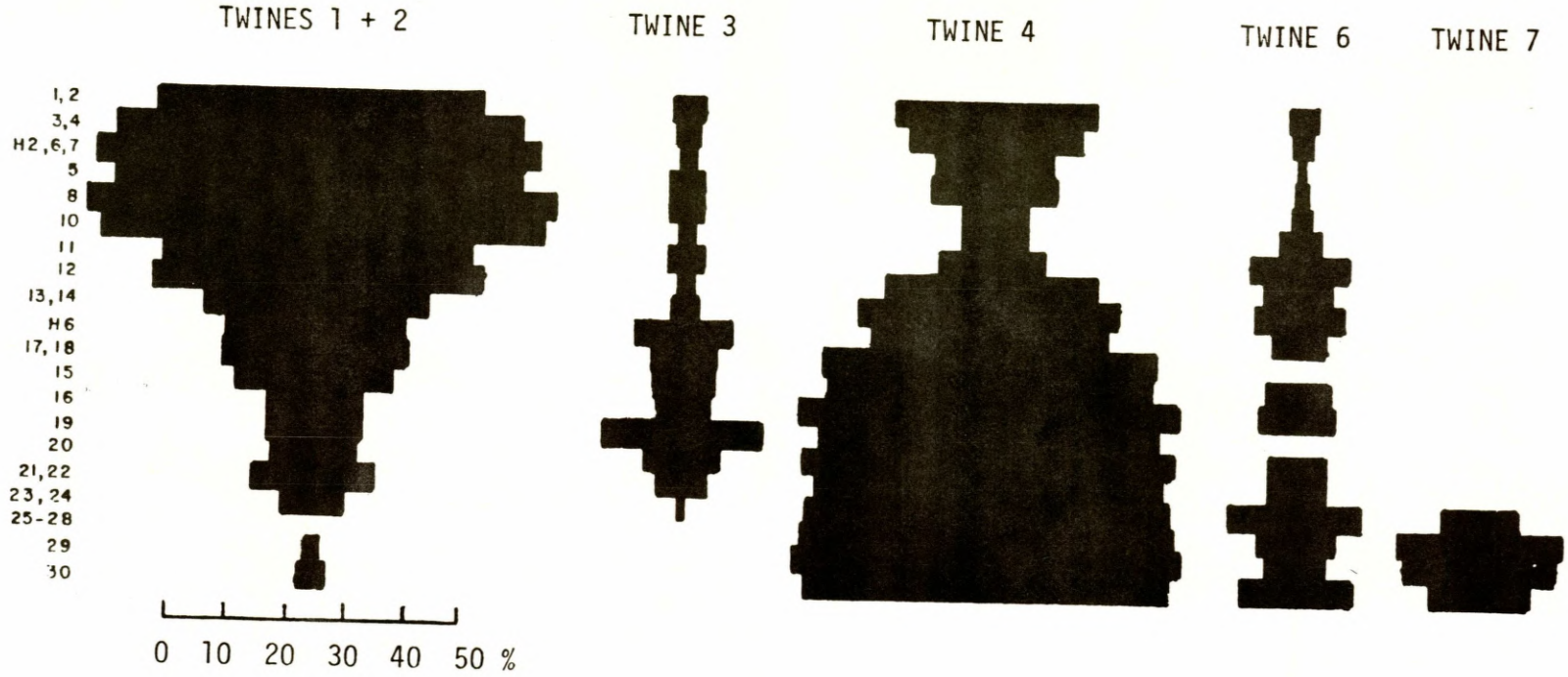


Figure 37 Relative frequencies of six twine motifs through time at Mound 1 expressed as percent of total twine-decorated rim and body sherds per level.

Figure 38 Relative frequencies of six twine motifs through time at Mound 2 and Jarfield 1 expressed as percent of total twine-decorated rim and body sherds per level.

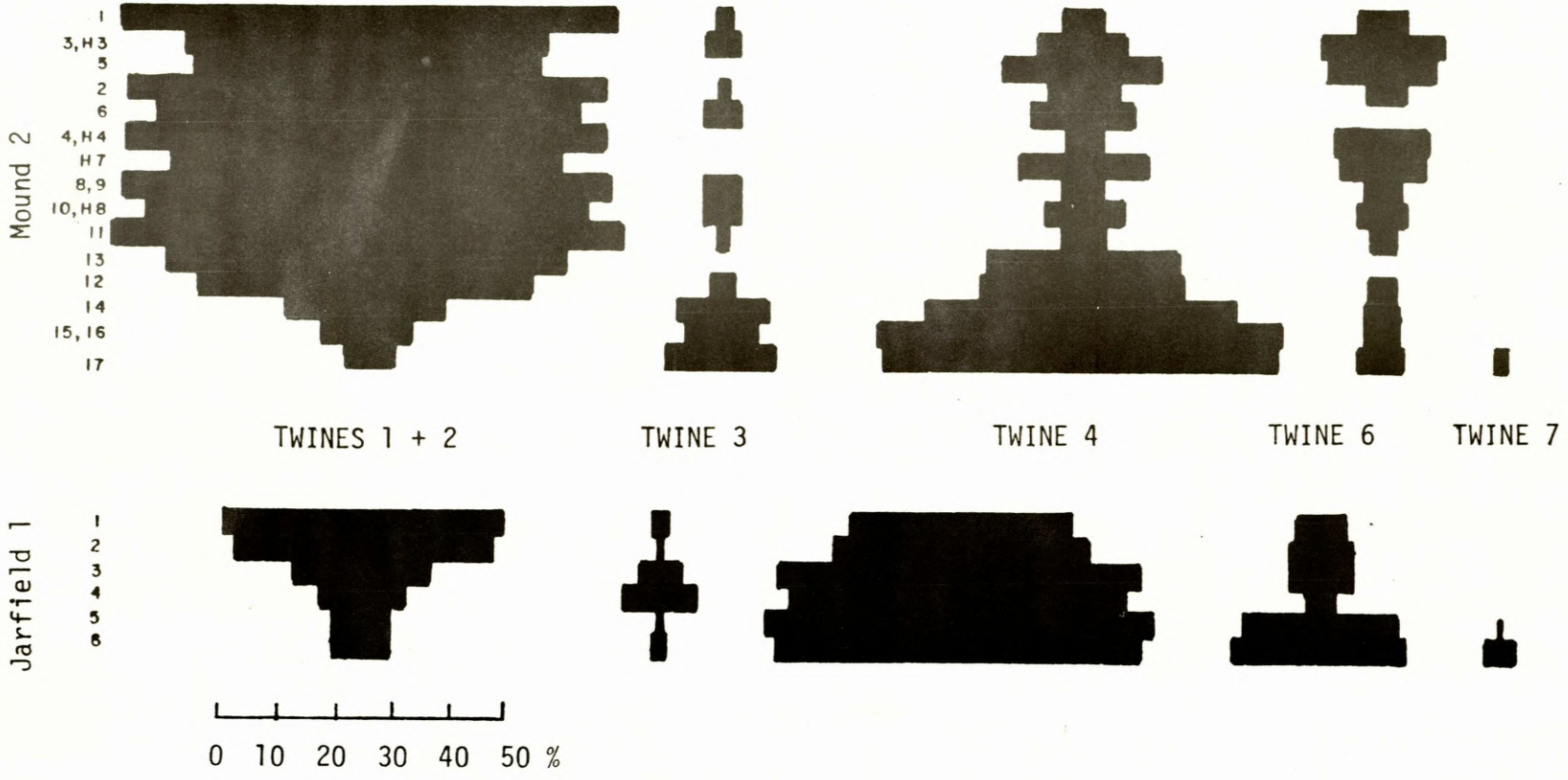


Figure 39 Cumulative graph of the relative frequencies of painted rim (——) and body (---) sherds expressed as percent of rim + body sherds per level.

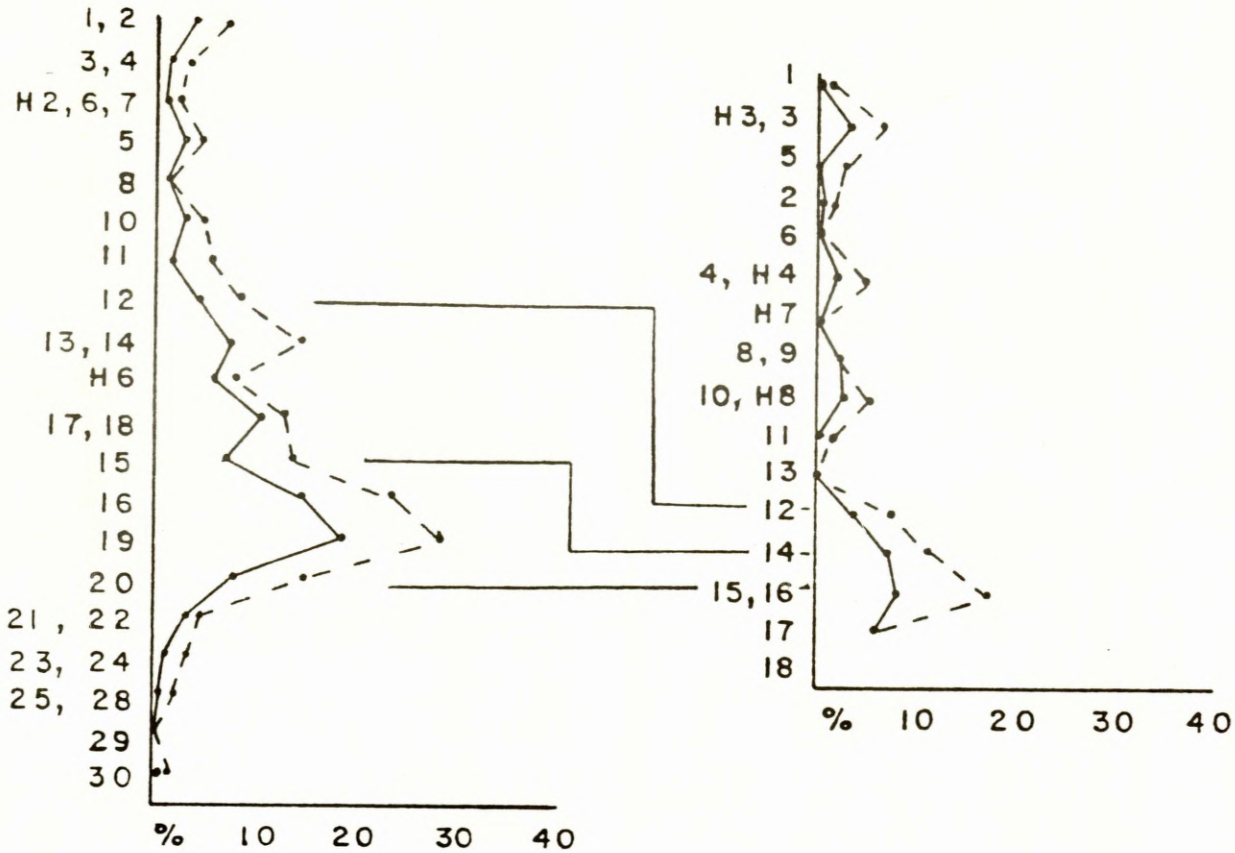
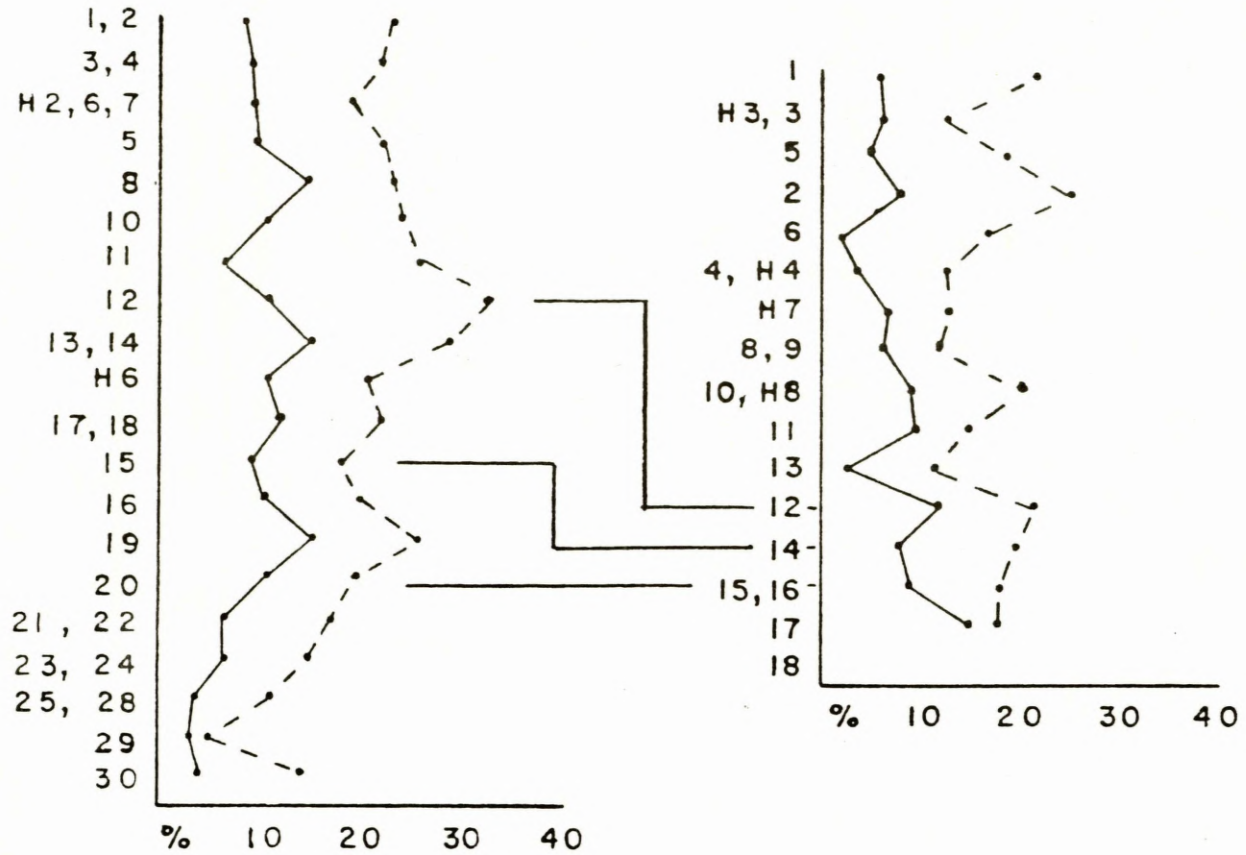
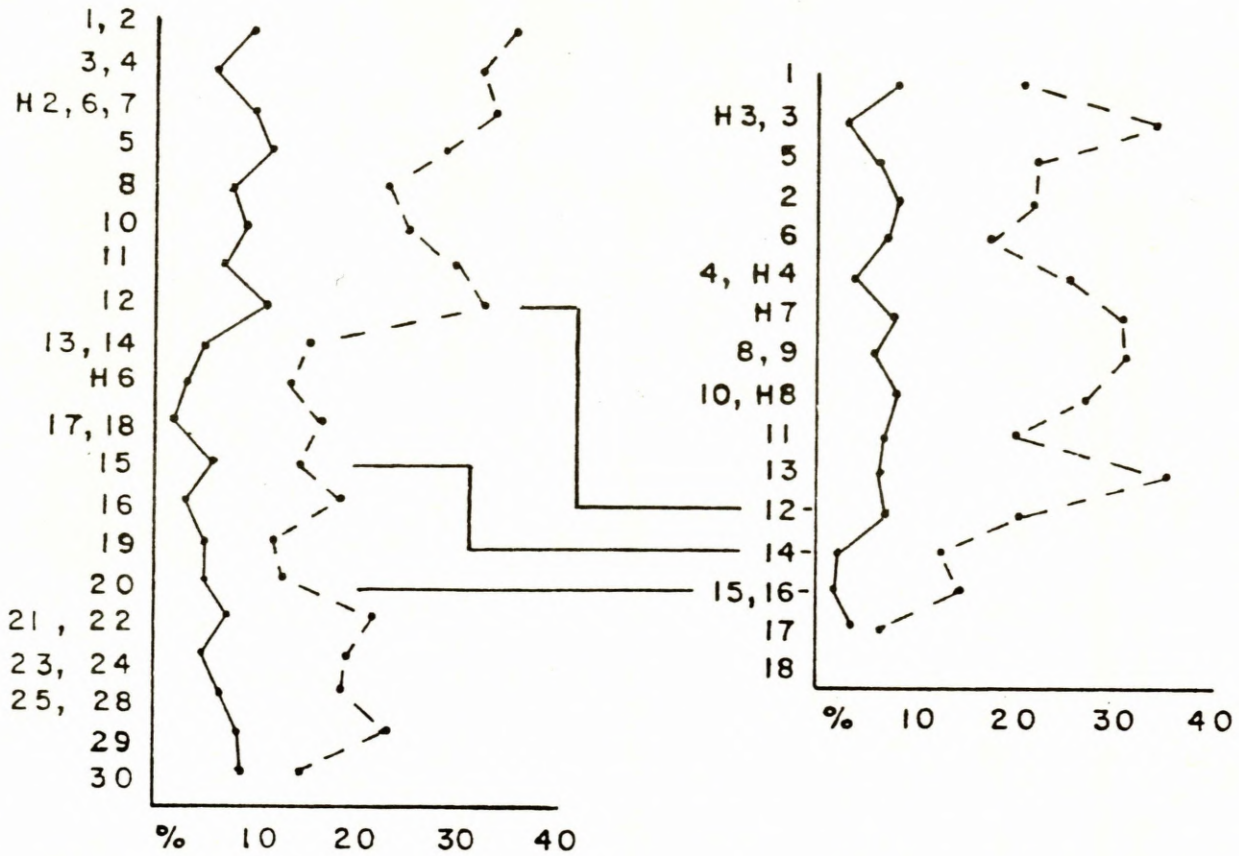


Figure 40 Cumulative graph of the relative frequencies of plastic-decorated rim (——) and body (---) sherds expressed as percent of rim + body sherds per level.



MOUND 1 MOUND 2

Figure 41 Cumulative graph of the relative frequencies of undecorated rim (——) and body (---) sherds expressed as percent of rim + body sherds per level.



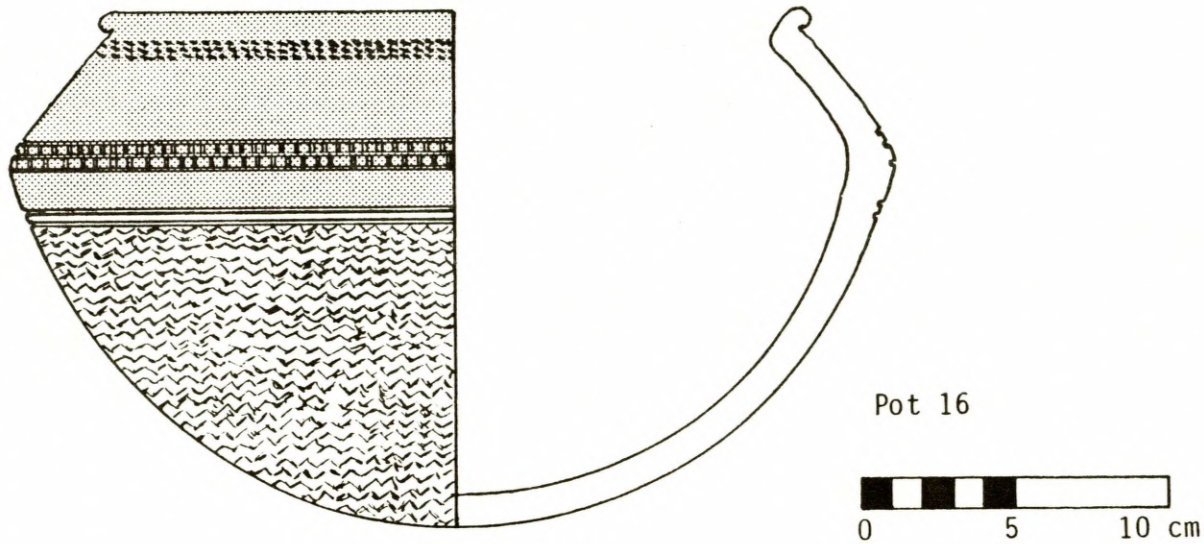


Figure 42. Carinated bowl associated with terracotta statuette

Mound 2 Level 2; rim - 14; paste - medium with grog; color - clear light orange; dark orange/red slip inside; contained rice husks and seeds of purslane.

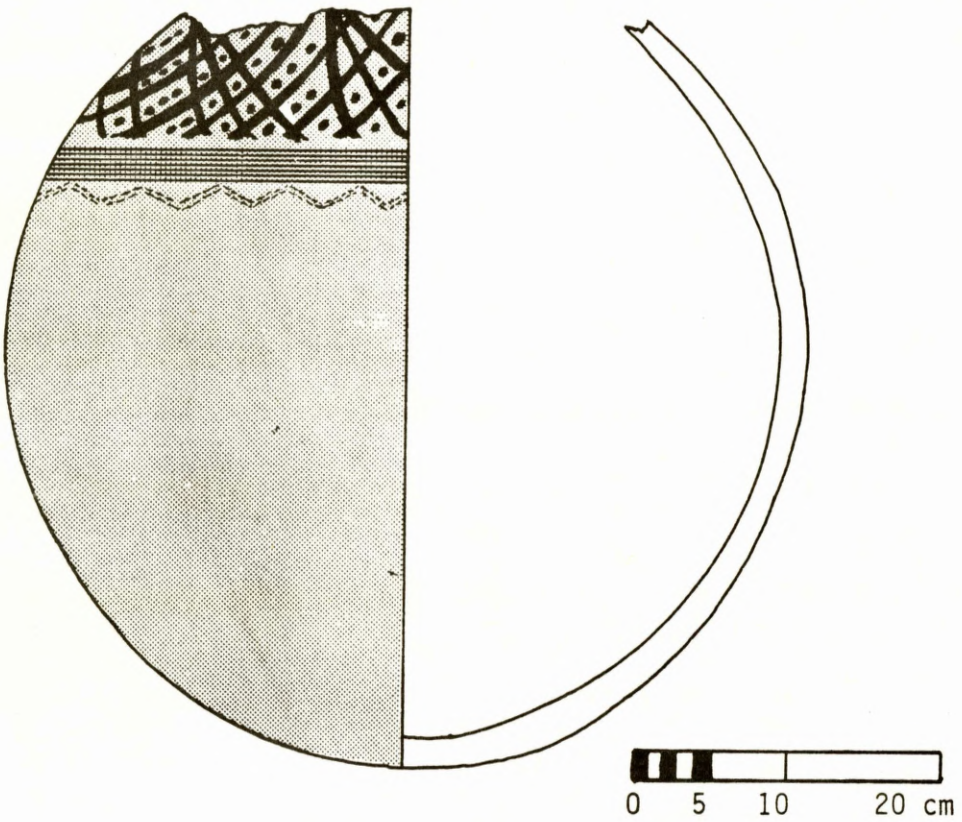


Figure 43. Jar 10

Visible on surface of Mound 2 within walls of Houses 3 and 4; rim - unknown; paste - medium with grog; color - clear light orange/buff; no interior slip.

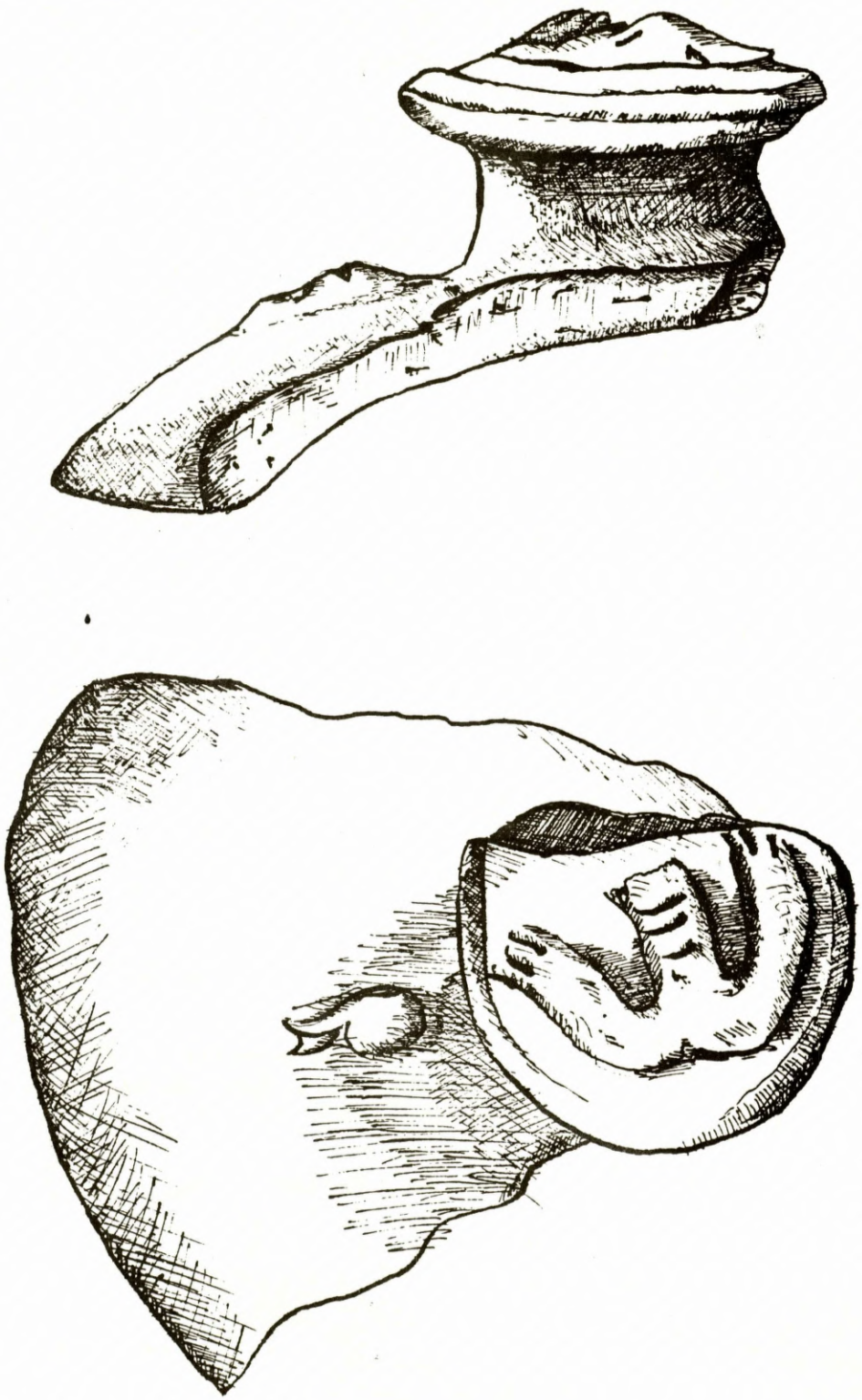


Figure 44. Potlid with raised relief decoration (scale 1:1)

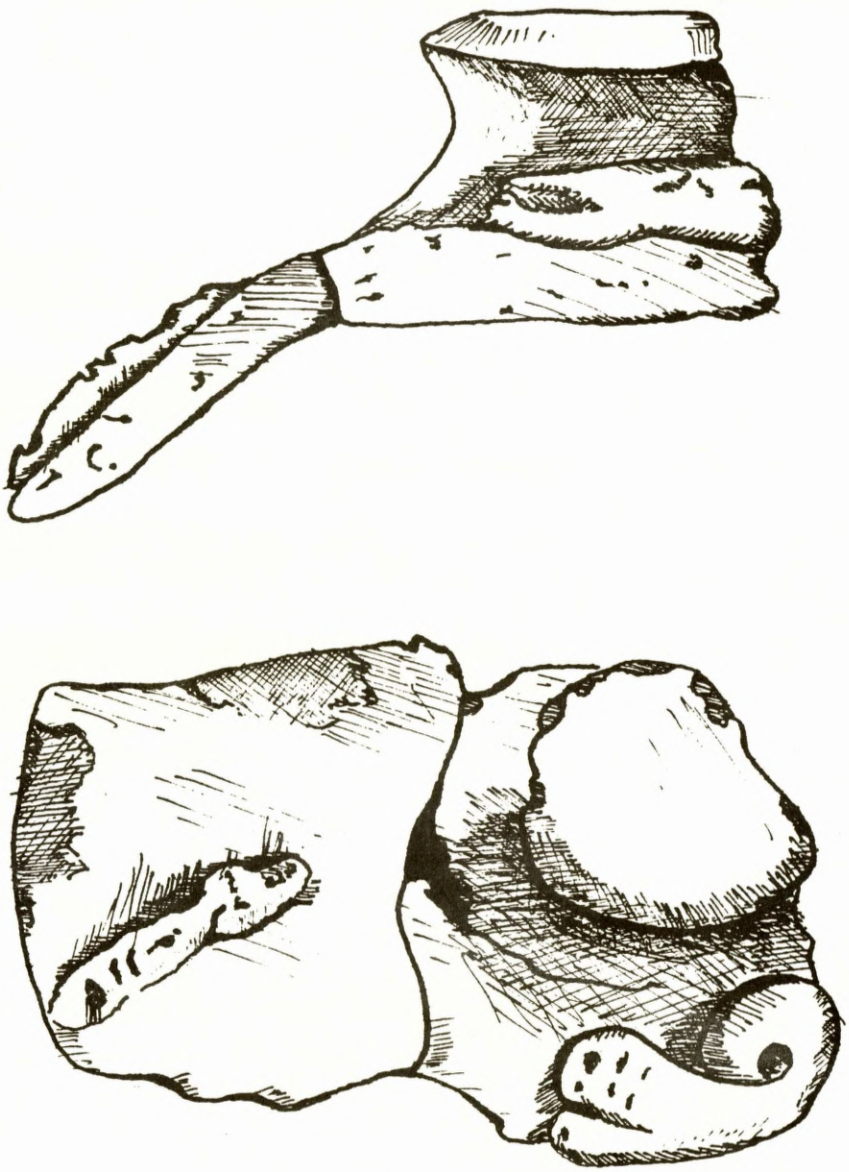


Figure 45. Potlid with raised relief decoration (anteater?) (scale 1:1)

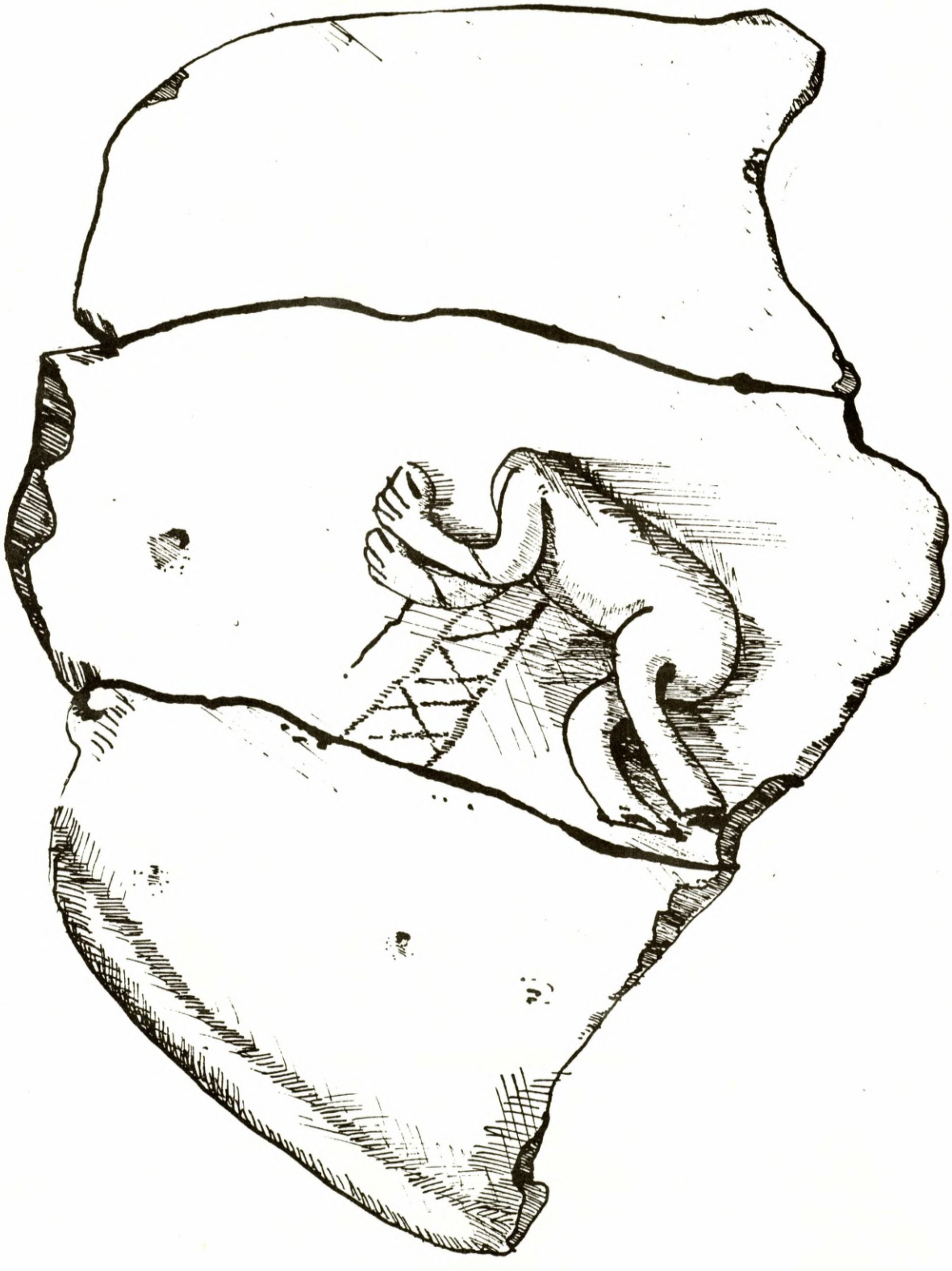


Figure 46. Potlid with raised relief decoration (scale 1:1)

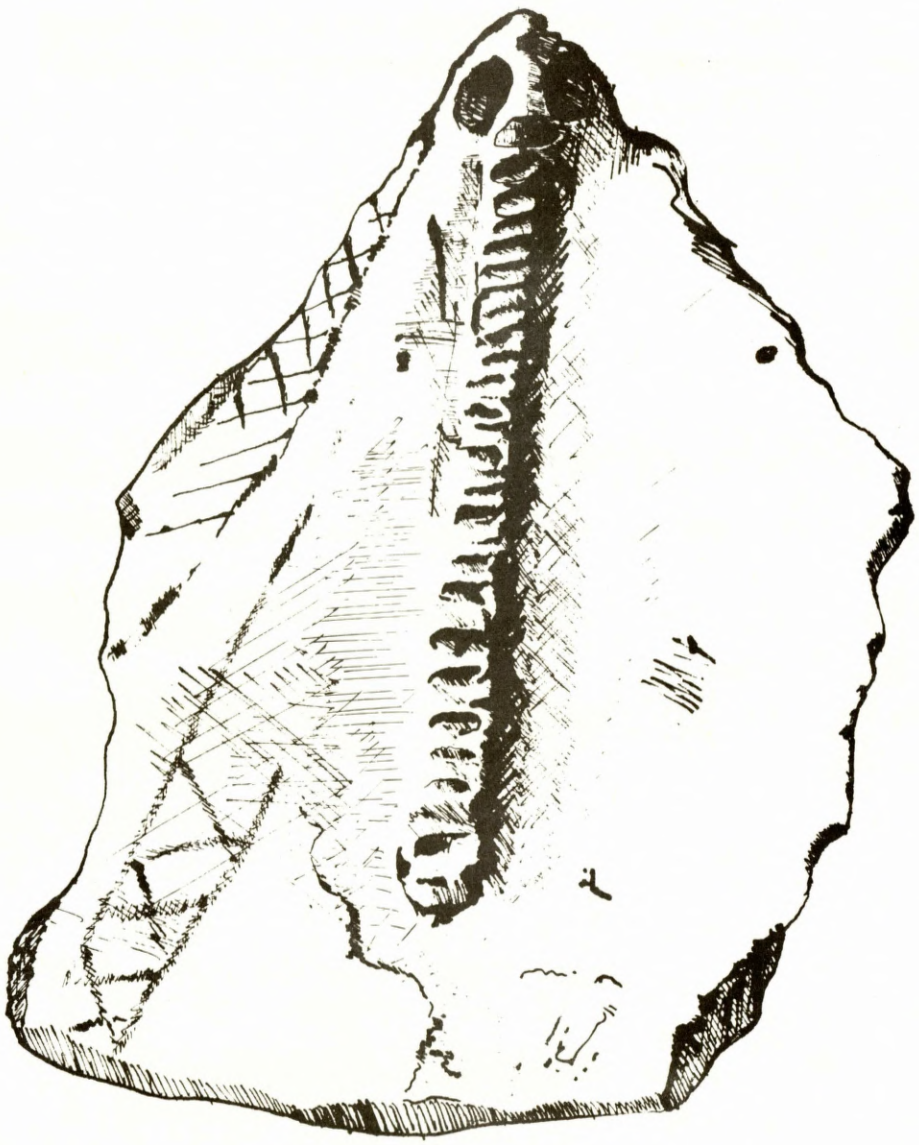
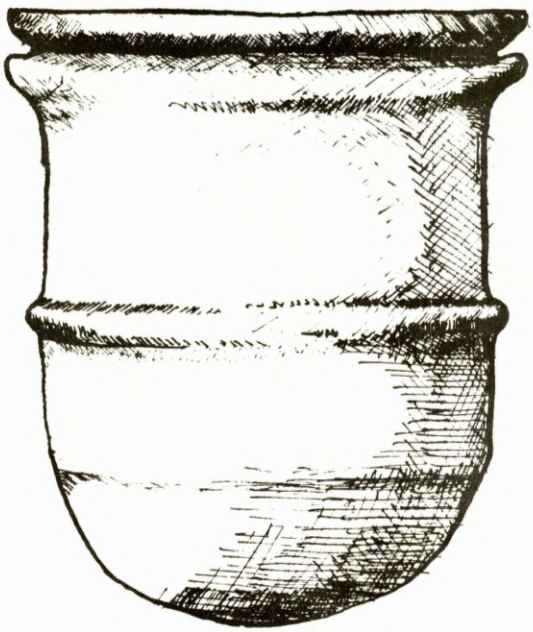


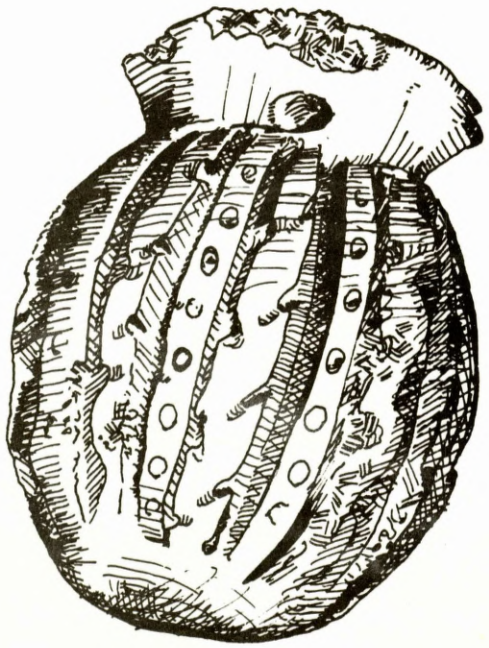
Figure 47. Potlid with raised relief decoration (serpent?)
(scale 1:1)

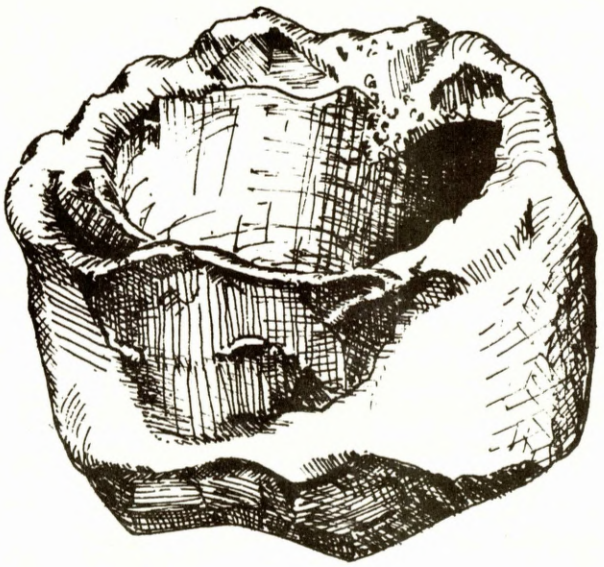


U-shaped, flanged beaker from M2, Level 2 (scale 1:2)

FIGURE 48

Ceramic "pestle" from M2, Level 2 (scale 1:1)

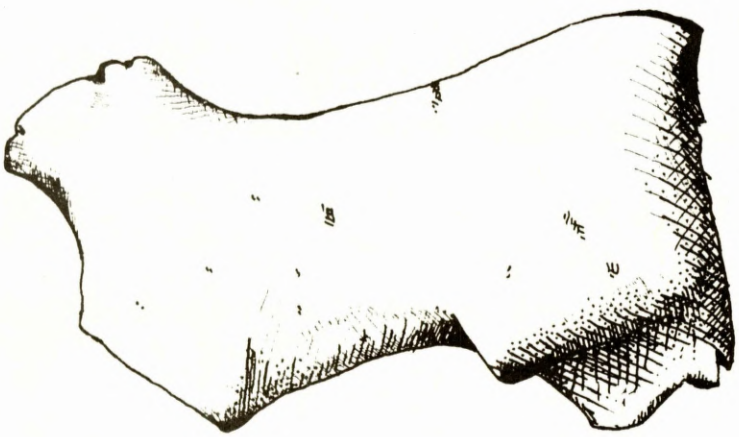


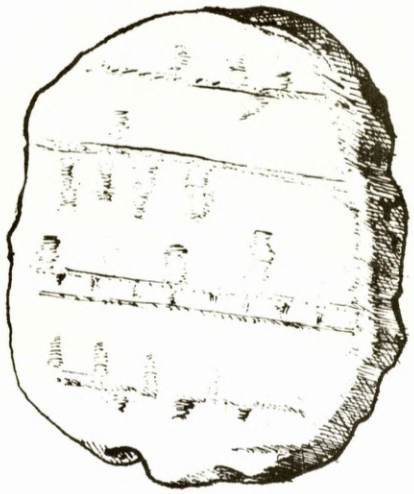


"Crucible" from M1,
Level 8 (scale 2:1)

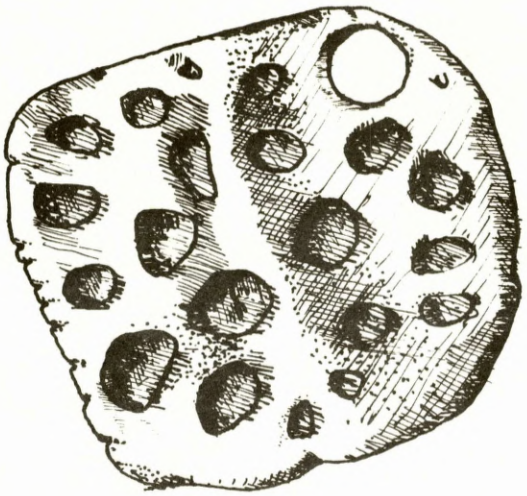
FIGURE 49

zoomorphic figurine
from M1, Level 14
(scale 2:1)



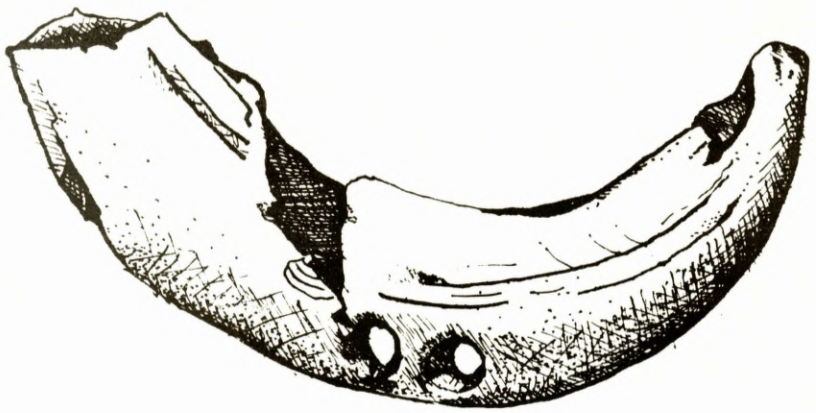


"Pottery goldweight" (?) from
JF1, Level 6 (scale 2:1)

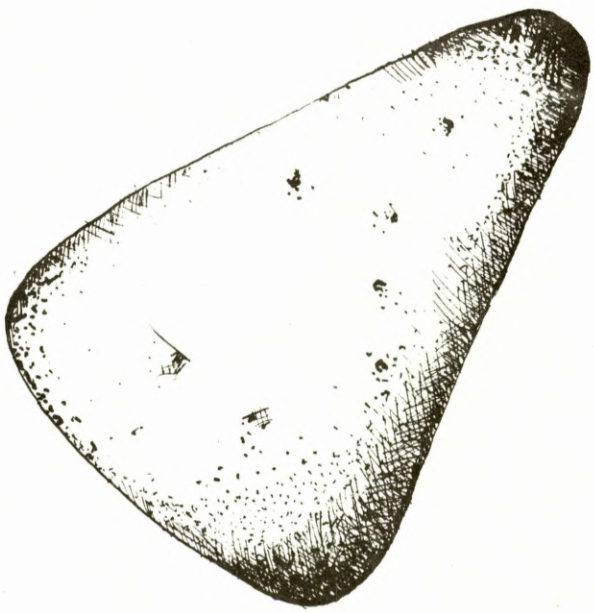


Pendant on epidermic plate of a crocodile, from M2, Level 18 (scale 2:1)

FIGURE 50



Biconically perforated warthog tusk from M1, Level 23 (scale 1:1)



Pecked and abraded rubbing stone from M1, Level 8 (scale 2:1)

Table A. Total rim and body sherds recorded from each excavated level of Mound 1.

Level	Total Sherds	Rim Sherds	Body Sherds
1	601	174	427
2	176	37	139
3	270	69	201
4	115	22	93
Hs 2	112	27	85
5	389	124	265
6	46	16	30
7	82	19	63
8	592	161	270
9	29	15	14
10	62	18	44
11	87	17	70
12	644	202	442
13	108	32	76
Hs 6	113	47	66
14	384	115	269
15	279	94	185
16	102	34	68
17	74	20	54
18	24	8	16
19	74	23	51
20	498	110	278
21	69	15	54
22	142	36	106
23	96	28	68
24	191	43	148
25	32	6	26
26	68	16	52
27	27	7	20
28	32	11	21
29	86	13	73
30	554	141	413

Table B. Total rim and body sherds recorded from each excavated level of Mound 2.

Level	Total Sherds	Rim Sherds	Body Sherds
1	123	39	84
2	110	40	70
3	22	8	14
Hs 3	15	3	12
4	13	2	11
Hs 4	21	5	16
5	110	35	75
6	32	6	26
Hs 7	62	22	40
8	72	23	49
9	21	8	13
10	126	52	74
Hs 8	15	4	11
11	236	116	120
12	258	110	148
13	34	8	26
14	83	31	52
15	77	21	56
16	10	2	8
17	109	53	56

TABLE C. Frequencies of major rim classes from excavated levels in M1

Rim	1,27	29	3,4	7,14	11,23	17	30	32	10,16,18	6,9,34	31,2	5	13	28	21	26	19	8	12	15	20
Level																					
1	68	-	9	19	-	7	-	8	32	2	4	9	11	-	-	-	3	-	-	2	-
2	14	-	3	1	-	2	-	-	4	1	3	2	4	-	-	-	1	2	-	-	-
3	17	-	5	6	2	8	-	1	15	-	2	2	6	-	2	-	1	-	-	-	1
4	6	-	-	1	1	6	-	-	5	-	-	-	1	-	3	-	-	-	-	-	1
Hs2	4	-	1	4	2	9	-	-	4	-	-	1	1	-	1	-	-	-	-	-	-
6	7	-	-	2	-	4	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-
7	5	-	-	1	1	2	-	1	1	1	1	1	1	-	1	1	1	-	-	-	-
5	31	-	12	11	-	20	-	4	14	5	4	7	7	-	4	0	1	-	-	-	1
8	78	-	15	18	1	-	-	8	9	5	8	4	6	-	-	-	-	3	1	1	-
9	1	-	2	2	3	2	-	-	1	1	-	-	1	-	2	-	-	-	-	-	-
10	2	-	1	1	0	6	-	1	1	2	-	-	1	-	1	-	1	-	-	1	-
11	2	-	1	3	2	1	-	-	2	-	1	-	4	-	1	-	-	-	-	-	-
12	80	-	13	11	-	8	-	14	31	4	4	7	10	-	-	1	-	5	2	2	-
13	5	-	3	7	1	1	-	1	7	-	1	-	5	-	-	-	1	-	-	-	-
14	5	-	1	30	-	25	-	6	32	-	1	-	5	-	2	1	5	-	-	-	-
Hs6	5	-	1	6	-	9	-	1	18	1	-	-	2	-	1	2	-	-	-	-	-
17	1	-	2	4	-	8	-	1	3	-	-	-	-	-	1	-	-	-	-	-	-
18	-	-	-	1	-	5	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
15	14	-	3	17	-	21	-	2	23	-	5	1	3	-	1	1	2	-	-	1	-
16	1	-	2	6	-	9	-	2	8	-	3	-	1	-	1	-	1	-	-	-	-
19	-	-	-	6	-	7	-	-	6	-	-	-	1	-	2	-	1	-	-	-	-
20	10	-	1	15	-	29	1	2	35	1	2	1	1	1	4	2	1	-	1	-	-
21	5	-	-	3	-	2	-	-	4	-	-	-	-	-	-	-	-	-	-	-	1
22	10	-	-	1	1	10	-	-	9	-	-	-	-	3	1	-	1	-	-	-	-
23	8	-	-	4	2	4	2	-	6	-	2	-	-	-	-	-	-	-	-	-	-
24	11	6	-	1	-	2	2	1	9	-	5	1	1	-	-	2	1	-	-	-	-
25	1	2	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
26	-	2	-	1	-	1	4	-	5	1	2	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	2	2	-	2	-	1	-	-	-	-	-	-	-	-	-	-
28	8	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	1	-	-	-	-
29	4	1	-	-	-	1	4	-	-	1	1	-	1	-	-	-	-	-	-	-	-
30	34	9	3	8	-	19	12	-	19	6	27	-	1	-	2	-	-	-	1	-	-
	437	20	82	200	28	230	28	54	307	32	78	36	75	4	30	10	22	10	5	7	4

Rim 0=1; Rim 22=7; Rim 24=1; Rim 25=4

TABLE D. Frequencies of major rim classes from excavated levels in M2

Rim	1,27	29	3,4	7,14	11,23	17	30	32	10,16,18	6,9,34	31,2	5	13	28	21	26	19	8	12	15	20
Level																					
1	21	-	2	3	-	4	1	-	1	1	2	1	2	-	-	-	-	-	-	-	-
3	4	-	-	1	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Hs3	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
2	12	-	3	1	1	3	-	2	7	1	3	-	4	-	-	1	1	-	-	-	1
5	11	-	3	2	-	5	-	-	5	2	2	1	4	-	-	-	-	-	-	-	-
6	2	-	-	-	-	2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Hs4	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-
Hs7	8	-	3	1	-	1	-	1	4	2	-	1	1	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	2	-	1	1	-	1	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-
8	1	-	4	1	-	10	-	-	1	1	-	3	1	-	-	1	-	-	-	-	-
10	7	-	2	4	-	8	3	3	9	1	8	-	3	-	3	-	-	-	-	-	-
Hs8	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	35	-	2	5	13	18	5	3	14	2	5	4	4	2	1	-	-	-	2	-	-
13	2	-	-	1	-	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
12	19	-	6	14	14	10	5	5	23	2	5	7	8	3	-	-	-	-	-	1	-
14	5	-	-	7	-	8	-	1	4	2	1	-	1	1	-	-	-	-	-	-	-
15,16	2	-	-	8	-	-	1	-	8	1	-	-	1	-	2	-	-	-	-	-	-
17	13	5	-	4	-	1	-	1	20	0	8	-	-	1	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	149	6	26	54	14	78	15	16	101	16	35	19	31	8	7	2	1	0	2	1	1

Rim 22=3; Rim 24=1; Rim 25=1; Feature 8=2

Table E. Base sherds excavated from Mound 1 and Mound 2

	Level	number & type of base sherds	base sherds as % of body sherds in level
MOUND 1	1	2 ring	<0.01
	3	1 ring	<0.01
	4	1 ring	1.0
	Hs 2	1 ring	1.0
	5	5 ring 1 flat	1.9
	8	3 ring	1.1
	12	1 flat	<0.01
	14	3 ring	1.1
	15	6 ring 2 potlegs	3.2
	16	1 ring	1.5
	17	1 ring	1.7
	20	9 ring	3.2
	21	1 ring	1.7
	22	1 ring	1.0
	23	1 ring	1.5
	24	6 ring	3.4
	26	3 ring	5.7
	29	2 ring	2.8
	30	7 ring 1 flat 1 crown 5 potlegs	3.6
MOUND 2	Hs 7	2 ring	5.0
	11	4 ring	3.3
	12	1 ring 1 potleg	1.3
	14	1 ring	1.9
	17	1 ring 1 potleg	3.6

TABLE F. Occurrence of pot handles and lugs

	 Elliptical lugs	 Handles
M1		
Level 1	3	1
Level 3	2	
Level 5	1	1
Level 8	2	
Level 9	1	
Level 11	1	
Level 12	2	
Level 13	1	
House 6	3	
Level 15		1
Level 20	2	
Level 21		1
Level 23	1	
M2		
House 3		1
Level 8		2
Level 12	2	
Level 14		2
Level 15		1

Table G. Mean sherd thickness for major rim classes

Rim	MOUND 1 number	MOUND 1 mean	MOUND 1 Standard deviation	MOUND 2 number	MOUND 2 mean	MOUND 2 standard deviation
1	354	11.93 mm	2.95	81	12.68 mm	3.13
2	67	10.45 mm	3.36	27	10.85 mm	2.35
3	74	13.63 mm	4.19	22	14.09 mm	4.95
7	90	10.14 mm	2.50	7	10.86 mm	1.57
10	83	11.45 mm	3.11	21	13.66 mm	3.31
13	75	13.63 mm	4.03	31	16.42 mm	4.17
14	110	10.24 mm	2.34	47	10.44 mm	2.20
16	203	10.06 mm	2.45	74	11.63 mm	2.33
17	230	11.30 mm	2.47	79	13.64 mm	2.39
21	30	11.83 mm	2.48	7	15.57 mm	4.39
27	83	11.75 mm	2.99	68	12.59 mm	3.15
30	28	8.61 mm	1.89	15	12.47 mm	3.25
32	54	11.76 mm	3.58	16	11.57 mm	3.90

Table H. Colors recorded for painted rim + body sherds from each excavated level of Mound 1

Level	White	Magenta	Black	Red	Yellow Paste	Unspecified Color
1	36	10	2	2	1	
2	4	1	1			
3	4	1	3			
4		1				
Hs 2	2					
5	13	2				1
7	3					
8	6					1
10	1	1				1
11	3	1	1			
12	14	19	13	3	1	2
13	10		6			
Hs 6	5					2
14	39		15	1		2
15	33		7			
16	18	1	4	3		
17	5		2			
18	6					
19	19		2			
20	57	2	8	2		
21	3	1			2	
22	3	1		1		
23	1	1	1	2		
24	1	1	2			
26		1				
27	1					
30	1	1		3	13	

Table I. Attributes of plastic decoration recorded for rim + body sherds from each excavated level of Mound 1

Level	Grooves	Comb Impress	Incise	Stipple	Finger Impress	Stamp	Comb Drag
1	120	6	3	2	1	2	
2	32	1	1		2	1	1
3	58	1	1				
4	19		1		1		5
Hs 2	20	1	1		1		2
5	70	2	7		2	2	7
6	5						1
7	13					1	1
8	96	10	5		3		5
9	5				1	1	
10	11		3				1
11	17				1	1	1
12	144	3	1				
13	32		1		1	1	1
Hs 6	23			2			
14	101	1	2				4
15	49			2			1
16	20			1			
17	16						
18	6						
19	19						
20	71	2		6			
21	7						
22	21		1	1		1	
23	9						1
24	28	2	2				
25	3		4				
26	8		1				
27	2						
28	1						
29	3						
30	55		7	5			

Table J. Decorative Attributes recorded for rim + body sherds from each excavated level of Mound 2

PAINT

Level	White	Magenta	Black	Red
1		1		
2	2			
3+Hs 3	2	1		
4+Hs 4	2			
5	2		1	
8 + 9	1		1	
10 + Hs 8	7		1	
11	3			1
12	17	1	2	
14	13		1	
15 + 16	16		2	
17	9			

PLASTIC

Level	Grooves	Comb Impress	Incise	Stipple	Finger Impress	Stamp	Comb Drag
1	20		1		1	5	
2	21		3	1		2	1
3+Hs 3	3		1				
4+Hs 4	5						
5	21						2
6	5				1		
Hs 7	8	1	2				
8 + 9	9	3				1	1
10+Hs 8	25		2		1	1	5
11	36		3				6
12	63		2	1			1
13	1		1				2
14	17	2		1			
15 + 16	20			2			
17	26		1				

APPENDIX III

ARCHAEOLOGICAL SITES IN MALI

EXPLANATORY NOTES FOR APPENDIX III

This list of archaeological sites with Iron Age components investigated in Mali prior to 1977 records site name, date of investigation, and method of investigation, followed by categorization of site type (e.g., tumulus, settlement site, etc.), and references and publications concerning the results of the investigation. Site numbers locate sites on the accompanying map. Method of investigation is classified according to the degree of control maintained in the field. Full Control is defined as the appreciation by the excavator of stratigraphy, association of site elements, and the accurate recording and publication of those elements. Limited Control implies that full measurements were taken in one dimension only (usually the vertical). Only informal records, such as schematic vertical sections, were kept at sites dug by Nominal Control. No Control means extensive excavation without reference to stratigraphy, association, or proper recording procedures. Surface Collection includes the selection of certain artifact classes from the site surface and pot-hunting.

LIST OF ARCHAEOLOGICAL SITES (c. 500 B.C.- A.D.1800)

INVESTIGATED IN MALI PRIOR TO 1977

#	SITE	DATE INVESTIGATED	INVESTIGATOR	METHOD OF INVESTIGATION
1.	Baguineda (Tumulus);	1929	Pomozanoff reported in Mauny 1961:100	Surface Collection
2.	nr. Bamako (Hypogeum);	1976-7	A.O.Konare Konare:pers. comm., 1977	Full Control
3.	nr. Bandiagara (Rock shelter);	1952	G.Szumowski Szumowski 1956c	Surface Collection
4.	Bankoni (Pseudotumulus);	1954-5	G.Szumowski Szumowski 1958	No Control
5.	Bango (Settlement);	1952	G.Szumowski Szumowski 1957a; Mauny 1961:103	Nominal Control
6.	Bougoumeira (Tumulus?);	1940?	P.Avinen Avinen 1942	Surface Collection
7.	Dalabani (Hypogeum);	1950	V.Paques Mauny 1961:127	No Control
8.	Danewal (Settlement);	1945	T.Monod Mauny 1949; Sculpture Soudanaise 1947	Surface Collection
9.	Diguidiguida (Settlement);	1952	G.Szumowski Szumowski 1961	No Control
10.	Dioura (Settlement);	1952	G.Szumowski Szumowski 1957a; Mauny 1961:103	No Control
11.	Djimdjim (Settlement);	1954-5	R.Mauny, J.Daget Mauny 1961:104-5	Nominal Control
12.	Dogo (Hypogeum);	1970	M.Cisse Liesegang 1975a	No Control?
		1973-4	G.Liesegang Liesegang 1975a, 1975b, 1977	Full Control?

13. Doupwil (Settlement); 1975 R.M.A.Bedaux Limited Control
Bedaux 1975, 1976, n.d.

14. el-Oualadgi (Tumulus); 1904 LT.Desplagnes Nominal Control
Desplagnes 1907:57-66, 1951;
Lebeuf and Paques 1970:23-50

1954 R.Mauny Surface Collection
Mauny 1961:96-7

15. nr.Famanbougou (Hypogeum); 1971 M.Cisse No Control
Liesegang 1975a

1973-4 G.Liesegang Full Control?
Liesegang 1975a, 1975b, 1977

16. Fatoma (Settlement); 1952 G.Szumowski Nominal Control
Szumowski 1954; Mauny 1961:102

17. Feto-Kole (Settlement); 1952 G.Szumowski No Control
Szumowski 1957a; Mauny 1961:103

18. Galia (Settlement); 1975 R.M.A.Bedaux Limited Control
Bedaux 1975, 1976, n.d.

19. Gao ancien (Urban); 1931 B.le Pontois Surface Collection
Mauny 1961:112-3

1949 J.Kikoine No Control
Mauny 1961:112-3; Flight 1978b

1950-1 R.Mauny Nominal Control
Mauny 1961:112-3, 492-3, 498-9

20. Gao Sane (Urban); 1939 M.Bartoli No Control
Mauny 1961:113; Flight 1978b

1972,1974 and 1978 C.Flight Full Control
Flight 1975b, 1978b, 1979

21. Goubo (Tumulus); 1931-2 H.Clerisse No Control
Mauny 1961:101

22. Jenne-jeno (Urban); 1938 G.Vieillard No Control
Mauny 1961:102

23. Kami (Settlement) 1948 R.Mauny Surface Collection
Mauny 1949

1949-50 D.Wintrebert Surface Collection
Masson-Detourbet 1953; Mauny 1961:102

1952 G.Szumowski No Control
Szumowski 1955a

24. Kaniana (Urban);	1933	C.Daire Mauny 1961:101; Vieillard 1940	Surface Collection	
	1943	T.Monod Monod 1943	Surface Collection	
	1955	J.Daget Daget 1955	Surface Collection	
25. Ke-Bozo (Settlement);	1952	G.Szumowski Szumowski 1957a	Surface Collection	
26. Kelebere (Settlement);	1956	G.Szumowski Szumowski 1956a; Mauny 1961:102	No Control	
27. Koa (Settlement);	c.1900	inhabitants Ligers 1957	Surface collection	
	1964	H.Haselberger Haselberger 1965,1966	Surface Collection	
28. Kolima (Settlement);	1930	Christoforoff Mauny 1961:97-100	No Control	
	1954	R.Mauny Mauny 1961:100	Surface Collection	
29. nr. Koubai (Settlement);	1952	M.Bardage Szumowski 1955a; Masson-Detourbet 1953	Surface Collection	
30. Kouga (Tumulus);	1954-5	R.Mauny, J.Daget Mauny 1961:106-11; 1964	Full Control	
31. Koukiya (Settlement);	1921	G.de Gironcourt Mauny 1961:120; de Gironcourt 1911	Surface Collection	
32. Kourounkorokale (Rock shelter);	1951-3	G.Szumowski Szumowski 1956b	Nominal Control	
33. Macina (Settlement);	1952	G.Szumowski Szumowski 1957a	Surface Collection	
34. Moribadougou (Pseudotumulus);	1954	G.Szumowski Szumowski 1958	No Control	
35. Nantaka (Settlement);	1948	R.Mauny Mauny 1949	Surface Collection	
	1952	G.Szumowski Szumowski 1956a; Mauny 1961:102	No Control	
36. Ngomi (Pseudotumulus),	1954	G.Szumowski Szumowski 1958	NO Control	

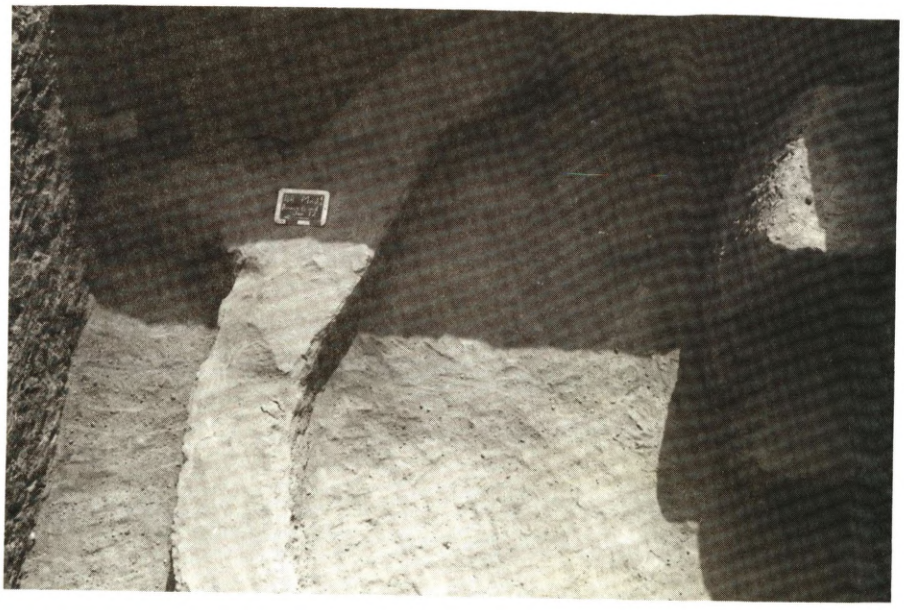


Plate III. Curvilinear tauf wall of House 6 in M1. Top of wall is between 1520 - 1580mm below Point of Origin.



Plate IV. Terracotta statuette and associated pottery in situ



Plate V. Incised and alternate-zoned twine roulette (Twine 7) on a large sherd from M1, level 26.



Plate VI. Twine types identified on Jenne-jeno pottery: Coarse woven-Twine 1 (top left and center); woven large chevron-Twine 2 (top right, center left); double chevron-Twine 3 (center right); fishnet-Twine 4 (bottom left); and roulette-Twine 6 (bottom center and right).



Plate VII. Clay impressions of twine decoration on sherds in VI, presented in same order



Plate VIII. Plastic decoration on Jenne-jeno pottery: top left-twine impression and incision; top right--parallel grooves and incision; center left--non-parallel; shallow grooves; center right--incision; bottom left--incision and stabbing; bottom center--parallel grooves; bottom right--twine roulette and stabbing.



Plate IX. Side view of terracotta statuette from M2



Plate X. Miscellaneous objects from Jenne-jeno (left to right: fired clay "nail", wooden knife handle, horn "needle")

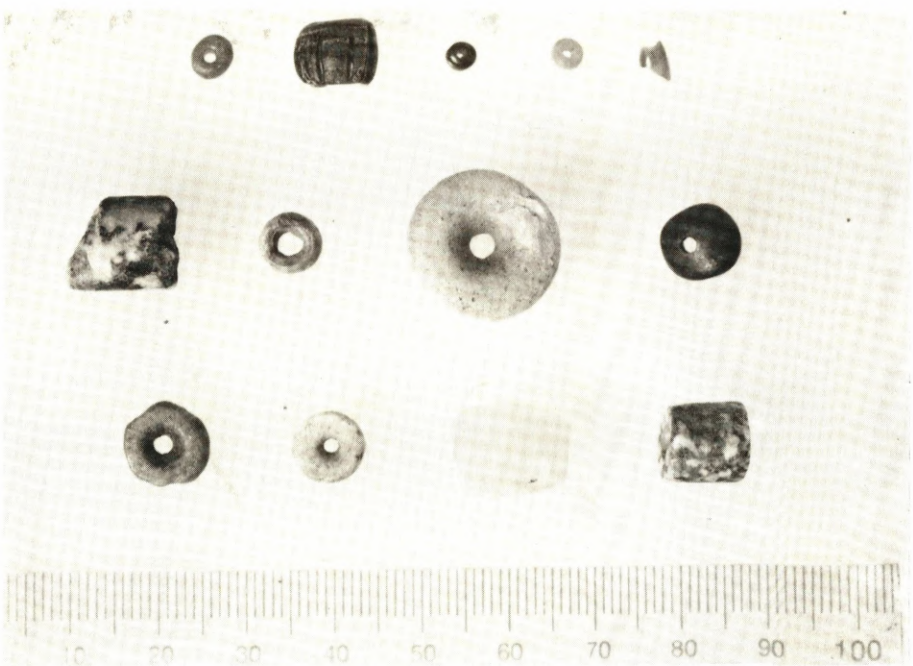


Plate XI. Glass and stone beads. Top row: glass beads a-e; left to right; Middle row: stone beads f-i, left to right; Bottom row: stone beads j-m, left to right



Plate XII. Copper artifacts (a-f starting at top left and proceeding clockwise).

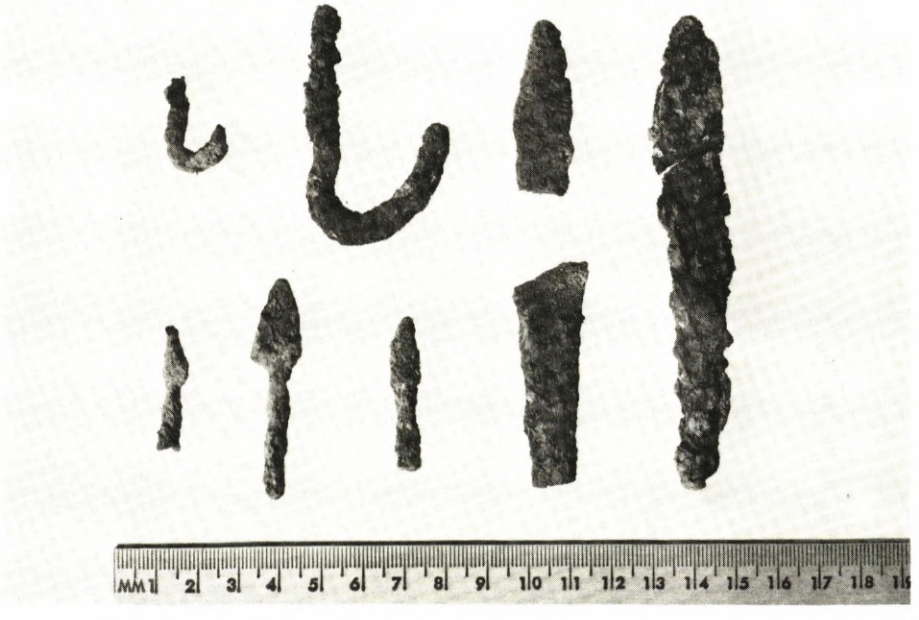


Plate XIII. Utilitarian iron artifacts (a-h starting at top left and proceeding clockwise).



Plate XIV. Decorative iron artifacts (a-d, starting at left with large bracelet and proceeding clockwise).

Prehistoric Investigations in the Region of Jenne, Mali

A Study in the Development of Urbanism in the Sahel

Part ii : The Regional Survey and Conclusions

Susan Keech McIntosh and
Roderick J. McIntosh

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Part ii

SECTION I

BACKGROUND TO THE REGIONAL SURVEY

CHAPTER 1

AN INTRODUCTION TO THE STUDY OF SETTLEMENT HIERARCHIES IN WEST AFRICA

Introduction

In this monograph the authors have investigated the emergence of urban Jenne by two quite different methods. Evidence of the settlement and growth of the principal site is presented in the first part; here we record results of an extensive regional survey conducted immediately after the excavations at Jenne-jeno. The survey was undertaken in an area which had been investigated only very superficially before the 1977 season. The goals and results of the first season of survey were therefore modest: to investigate the nature and chronology of human occupation in the immediate hinterland of Jenne. Only the most exploratory and tentative steps have been taken towards an appreciation of the regional factor in the urbanisation process in this part of West Africa. The field season of 1977 did not provide an explanation of why several large settlements and a complement of many tiny hamlets developed in the western Inland Niger Delta in the first millennium A. D., nor a secure chronology for their appearance. Rather, the major contribution of the survey project include basic settlement data of an exploratory nature, identification of a series of topics meriting future, in-depth investigation, and an appreciation of field methods most suited to the investigation of these topics.

The definition of urbanism in this region remains as elusive as ever. However, initial steps have been taken which may eventually provide the kind of information needed in order to recognise and explain the development of pre-islamic and pre-colonial complex settlement hierarchies in sub-Saharan Africa.

Geographers and sociologists have long attempted to agree upon a definition of the city and the features of urbanisation. A number of criteria have been proposed in the past to determine if a particular settlement might be classified as urban; these have included size, number and density of population, variety of occupation, heterogeneity of class structure, minimum percentage of non-agricultural workers, presence of large or communially-used buildings, amount of space between buildings, and presence of functional differentiation (political, administrative, commercial, industrial, and cultural) (Beaujeu-Garnier and Chabot 1967:23-31; Jones 1966:4-9; reviewed from the archaeological perspective in Alexander 1972:843-844). Each of these criteria has been found to fail the test of uniform applicability, even to modern Europe and North America (cf., Jones 1966: 40).

Equally unsuccessful has been the attempt to isolate universal characteristics of the pre-industrial city, defined by Sjoberg (1955) inter alia as a

marketing and handicraft manufacturing centre in which only human or animal sources of energy are available to effect production of goods and services. The constellation of attributes particular to pre-industrial cities (rigid social and ethnic stratification in residential and occupational associations, little specialisation or fragmentation of work, few middlemen, spread of guild associations to all members of the population but the political or religious elite, highly particular or localised currency and accounting practices, and limited social mobility — Sjoberg 1955) applies to the medieval European city and, perhaps less satisfactorily, to certain better-studied Asian cities. However, the definitions are considerably less useful when applied to pre-industrial settlements in the non-western world, for example, the Yoruba or Hausa cities of Nigeria (Mabogunge 1968: 40-41; cf., Bascom 1958-1959; Gugler and Flanagan 1978). (For the difficulty of applying these same criteria to present-day Jenne, see recent studies by Gallais 1967 and Brasseur 1968: 424-448.)

As a consequence, certain geographers and sociologists have evolved a subjective and relative definition of the town: " In each country a town can be said to exist if the people of the district feel themselves to be in a town" (Beaujeu-Garnier and Chabot 1967: 30), or " A town is what is implied by the local people when they call a locality a town" (Jones 1966: 5). Geographers have also resolved the problem of defining the difference between town and city by using the two words interchanably (Jones 1966: 5), as will be the practice in the present volume. However, the entirely subjective definition of the city is inadequate for the archaeologist looking for evidence of the process of urbanisation in the past. Clearly, the long-dead inhabitants of an archaeological settlement cannot be interviewed. Also to be considered is the necessity of a definition which makes reference to the type and quality of material evidence which the archaeolofist is likely to have available. For example, differentiation of class as a perceived reality does not survive, and the interpretation of heterogeneity of material culture within a settlement site or even a cemetery as a manifestation of one particular class structure has to be regarded with a critical eye in the absence of supporting evidence (e.g., literary or contemporary witness). The problem is compounded for the archaeologist in the non-western world by the limited amount of prior archaeological work.

If there are no universally-applicable criteria by which the archaeologist may identify a site as an urban settlement, is it therefore impossible to investigate the circumstances under which the urbanisation process takes place? Geographers have found it useful to investigate the often-symbiotic relationship between town and surrounding countryside and to define the region which falls under the influence of a particular city (the 'unland', 'hinterland', or 'city-region'; Beaujeu-Garnier and Chabot 1967: 431-442; Jones 1966: 11, 96-97). Geographers have recognised an increase in the number and variety of services available as one progresses up the settlement hierarchy from the agricultural hamlet to the true town (Beaujeu-Garnier and Chabot 1967: 436-442; Mabogunge 1968: 36). A useful way for the archaeologist to study the history of the emergence and the nature of urbanism in a region is not only to excavate the culmination of the process, i.e., the largest site in the region, but also to attempt to identify a hierarchy of interacting settlements, with the direction of complexity revealed by increasing heterogeneity of remains rather than by size alone. If a site supported a greater variety of occupations than

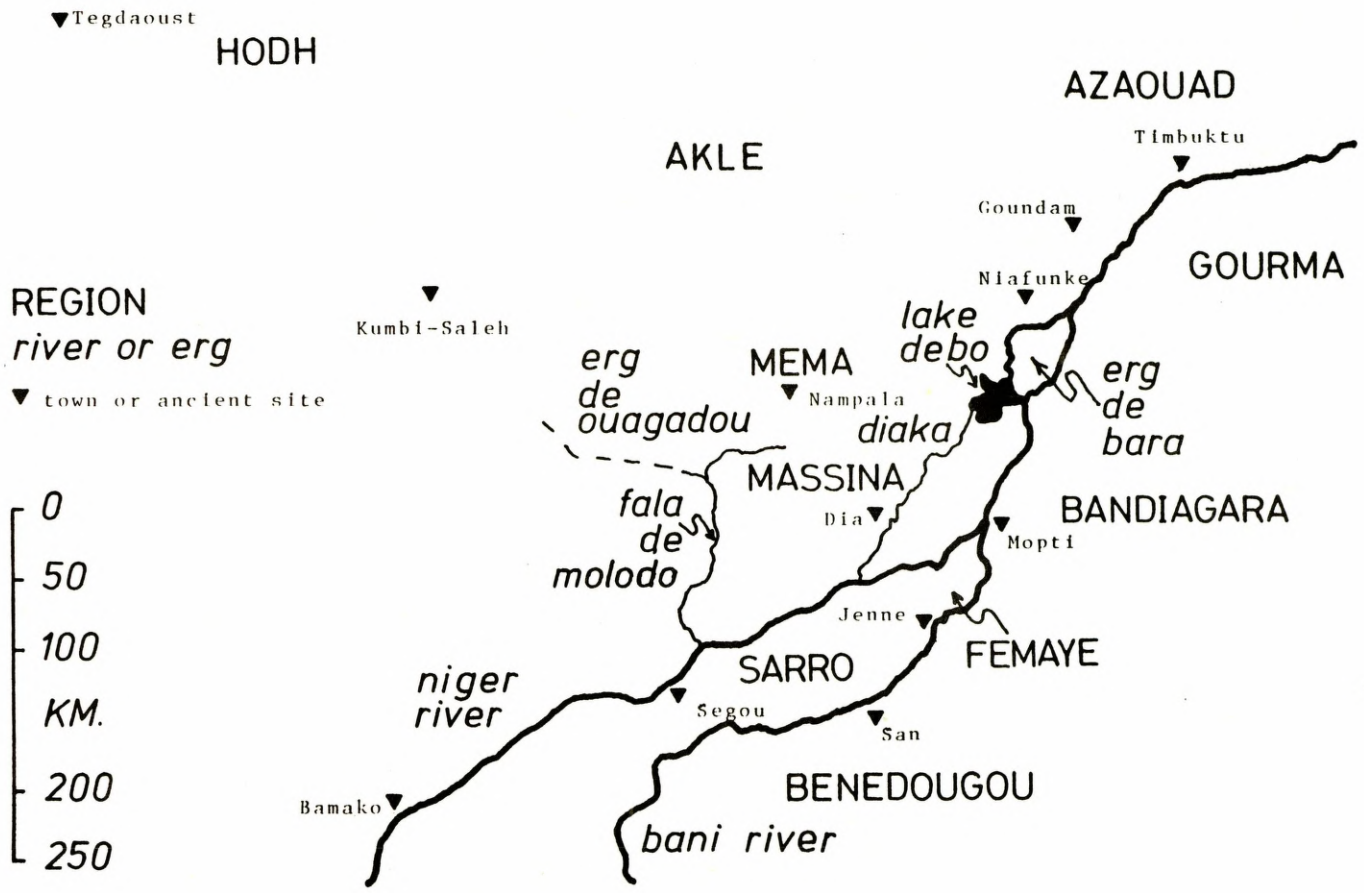
a neighbouring agrarian settlement, and if more of the priviledged of the society lived in the former, this difference will presumably be reflected in a greater diversity of items deposited there.

The major point is the degree of heterogeneity. A rural community may be rigidly hierarchical (as is rural India today), but the majority of rural communities in the same area may show the same principles of organisation, whereas a few (urban) communities in the same region may be appreciably more complex.

Note that in this model it is not required that traded goods, especially manufactured goods, invariably flow from the urban settlement down through the less-complex components of the hierarchy. Also, settlement size may increase with the heteregeneity of the population, although it need not necessarily do so. The study of settlement hierarchies implies the need to recognise some permanence of occupation (cf., Alexander 1972: 844). Even in this there may be exceptions. In some widespread and multi-ethnic African kingdoms the royal court and numerous dependents was an urban agglomeration, which nevertheless moved periodically from one part of the kingdom to another as a policy of political consolidation (reminiscent of the mobile court of European feudal times). A factor like this may explain why the capital of the Empire of Mali has proved so difficult to locate.

As a final consideration, if there were a variety of occupational specialisations in settlements occupying the more complex ranks of the settlement hierarchy, then there may have been more reason to trade and, in a familiar West African pattern, a greater degree of ethnic heterogeneity (Mabogunge 1968: 39-40). Ethnic heterogeneity may, but need not necessarily, contribute to a heterogeneity of building technologies, settlement structure (in the form of 'stranger' quarters), and artefacts dropped for the archaeologist. But once again, the way in which urbanisation as a diachronic process in pre-colonial (i.e., pre-industrial) West Africa can best be recognised by the archaeologist is by the identification of a settlement hierarchy through the examination of heterogeneity in features and artefacts (and secondarily by investigating attributes such as size, density of buildings, etc.) at a large sample of sites in a region. A large site does not become urban in isolation; change in the relationship among a number of settlements in a region, in which a tendency towards complexity, or heterogeneity, can be identified, is the historical process we have come to label urbanisation. Interest is as great in the principles, emergence, and development of the settlement hierarchy as in its finished expression as an integrated urban entity. At this early stage in the archaeology of West Africa it is probably necessary first to identify those criteria which typify local settlement hierarchies and then to formulate appropriate regional definitions of urbanism. Once this is done for a number of regions we may be able to distill out a more universal definition of urbanism.

Summary. It has been argued that the most effective way to investigate the appearance and development of the pre-colonial town in West Africa is not to excavate only the town site, but simultaneously to document and explain the evolution of the hierarchy of settlements of which the town is the summit. As a settlement becomes more urban, it is reasonable to assume



Features near the Inland Delta

Massina is rich in cereal and herds and is populated by perhaps a million Bobo (Marka?), Dogon, Mossi, Fulani, Tukulor, Songhay, Tuareg and Bambara. He saw many deserted villages on the distributary called Diaka leading to Dia and was told that four hundred villages in Bourgou (between the Diaka and Lake Debo) were now abandoned, the inhabitants either killed by the Tukulor or resettled in the interior. He was also told that one could find only Bozo living in wretched huts in the Jenneri (the region between the Niger and the Bani) and that Jenne had only 3,000 inhabitants remaining (Gallieni 1891: 212-214, 319). It must be recalled, however, that, the French by this time considered the successors to el-hajj Umar and Samori as their principal opponents in the Western Sudan; thus, there may have been some differences between Gallieni's official estimates of the population and potential force of the Inland Niger Delta and those found in these accounts tailored for public consumption in France.

The description of Jenne and Timbuktu by Felix Dubois (1897) appeared soon after the conquest by Archinard in 1893 and immediately preceeds the two works to be used heavily in later chapters, the Monographie de Djénné (Monteil 1903) and Haut-Sénégal-Niger by Delafosse (1912). Dubois was enthralled by the city of Jenne and by her inhabitants; he also saw direct Egyptian influence everywhere (Dubois 1897: 86, 90-99; cp. Delafosse 1912, I: 148). Dubois calls Jenne the "Mother of Timbuktu" (1897: 188) and believes that the latter was settled by Songhay from Jenne in order to tap the salt sources in the desert (1897: 170). The presence of the enterprising Songhay, river transport, the insular and walled defences of the town, ties of Jenne with the markets of Baramandougou, San and Bla (in the Benedougou to the south — southeast), and the agricultural wealth of the Jenne region caused Dubois to pronounce Jenne a greater commercial city than Timbuktu. About the wealth of the land he says:

> During all this time (since the Moroccan invasion) agriculture was interrupted and commerce destroyed. The river was deserted of its canoes, and the traffic of the caravan became impossible. The markets were empty, the population decimated by slavery and famine, and entire countries were depopulated by emigration.
>
> The negro race is so prolific, however, thanks to polygamy, and the earth is so fertile, thanks to the inundations of the Niger, that all these evils will be repaired in a few years owing to the peace and organisation we have introduced in the country (Dubois 1897: 141-142).

Neither Séku Amadou nor the Tukulor are treated charitably by Dubois, but neither does he document the alleged devastation of the countryside.

To the contrary, he remarks upon the large herds of healthy cattle, horses, sheep and goats on the banks of the Niger between Segou and Kouakourou (Dubois 1897: 26-27). From Kouakourou he took the Souman-Bani to Jenne, passing through the region surveyed during 1977. Unfortunately, there are no observations about villages, mounds or agricultural activity because, as he admits, Dubois was sheltering from the sun at the bottom of the pirogue during the entire journey (Dubois 1897: 80-81). Dubois was more observant in the town, it is from his plan and reconstructed drawings of the great mosque

destroyed by Séku Amadou that French engineers were able to rebuild the magnificent mosque in 1906-1907 (Dubois 1897: plates, pp. 155, 157, 161, 162 and 167; cf. Ba and Daget 1962: 156-157).

The final source of information about the early history of the town, oral traditions, have neither been systematically collected nor analysed by a student trained in the appropriate methodology. Nevertheless, there exists a sizable body of fragmentary traditions passed on by the authors of the ta'rikhs, collected by Europeans early in the colonial period (especially by Monteil [1903] and Delafosse [1912]), and more recently by scholars concerned with nineteenth century events (Ba and Daget 1962; Brown 1969). The problems with this source of information peculiar to cosmopolitan, polyethnic, and islamic Jenne are discussed by Prussin (1973: 63, 93-95) and R. McIntosh (1979: 30-41). The authors presented the traditions concerning the settlement and characteristics of Jenne and Jenne-jeno in the first part of this monograph; here we turn to a review of traditions concerning the ethnic distribution and economic potential of the region surrounding the city.

The present city of Jenne is an agglomeration covering four mounds allegedly first occupied on a seasonal basis by Bozo: Djoboro (named for the ancient settlement three kilometres away), Samseye, Damougal-soria, and Kanafa. The derivation of the name Jenne is uncertain. Monteil records a Bozo tradition that the name is a corruption of 'al-Djana', or 'a place (both above and) below Paradise' (Monteil 1932: 35; cf. Delafosse 1912, I: 270). The authors were told in 1977 that the name derives from 'djenatum', or 'place of the genies'. However, the most commonly accepted derivation is from the Nono Djana (as the name of the city was originally pronounced), meaning 'little Dia' (Montiel 1903: 263, 286). This refers to the persistent traditions of origin from the region of Dia on the Diaka distributary in the Massina. These traditions are important to the archaeologist for the light they may throw on the history of ethnic movements in this ethnographically complex region.

Traditions divide on the issue of whether the Bozo (Sorogo) of the Jenne region have always lived in the area, or were originally from two holes in the Massina, named Dia and Wotaka (Bozo from the former came to the Jenne area) (Monteil 1903: 94, 259-261; Delafosse 1912, I: 253-254). In 1977 we were told by one informant that the Bozo were always in the region, but by another that the Bozo were a relatively recent (although the first) migrants into the area which always before had been covered by permanent flood.

Monteil and Delafosse agree that the Nono (Marka) were once from the Dia area of the Massina, although the former believed that they were Sanhaja originally and Delafosse thought they were Soninke (Monteil 1903: 261-263 and 1932: 30-36; Delafosse 1912, I: 254-270). Delafosse collected traditions to the effect that an original wave of Soninke migrated into the Inland Niger Delta during the ninth century, but apparently did not settle at Jenne-jeno. This event had to await a second, much larger wave of Soninke, which arrived in c. A. D. 1250. Daget collected traditions in Dia to the effect that a Bozo

hunter found the site of Old Dia, but that occupation of the former site of Dia and the modern town was begun by two Nono families, the Tamota and Pamanta (Archives de l'I. F. A. N.-Dakar-XV-5-Mai, reproduced in Evrard 1977, I: 128-129).

Gallais has dealt with the suggestion that the Bozo, Nono and Dogon were originally from the Inland Niger Delta and perhaps once part of the same group (Gallais 1967, I: 78-80). The Bozo and Nono share many language and ritual traits and have complementary subsistence activities. The Bozo and Dogon share rituals involving fonio, have strong traditions of mutual help (cf. Daget 1948: 33-34) and may not intermarry (however, Nono may marry either Bozo or Dogon). It is this suggestion of Dogon origins from a pre-Bozo parentage that inspired the physical anthropologists and archaeologists of the Instituut voor Antropobiologie of the University of Utrecht to begin comparative anthropometric studies of Bozo and Dogon. Until their results are available and until more archaeology can be undertaken, it is best to conclude with Gallais that too few traditions of these groups have been recorded to form any opinion.

Nevertheless, a traditional myth of mutual aid between Bozo and Nono is highly relevant to a discussion of the beginnings of Jenne. The Tapama myth deals with the sacrifice of a Bozo girl to the spirits of the earth at the founding of Jenne (Monteil 1903:285-286 and 1932: 36). The myth recalls that the walls of recently constructed houses fell repeatedly (perhaps due to unusually high floods when the Inland Niger Delta was better watered), so the Nono, the first permanent settlers, begged the Bozo to pacify the spirits. A Bozo family from the village of Diera (seven kilometres to the southwest of Jenne), offered a virgin to be buried alive in what then became one of the eleven gates in the city wall around Jenne. The Bozo girl's name was Tapama Jennepo. The Jennepo family and allied families, the Tanapo (Tapama's maternal family) and Panapo, enjoy high status in the Jenne region and take a central role in collective fishing activities. To this day a Bozo female of the Jennepo family takes a dish of dried fish and chaff of millet (traditionally the first food of the Bozo) to all bridegrooms, who respond with a gift of a length of cloth. The Jennepo and Tanapo families interpose jointly each time the flood waters rise too high, and jointly sacrifice a bull on the nearby mound of Kaniana when the floods are late or too low. The myth of Tapama is still alive in the minds of the people. A workman told us that during years of high floods, unmarried girls of the villages around Jenne are kept indoors.

Oral traditions are not, on the whole, very informative about the settlements around Jenne. One source in the city claimed that in the beginning there was only Gao, Tendirma, and Jenne and all other villages were populated from these. Another source claimed that the villages of Soka, Gomitogo, Poina (or Pama), Tie, Kandara, Konsama and Koima (and Jenne) were populated by the former inhabitants of Jenne-jeno before the arrival of Sonni Ali in 1648, The massive site of Kaniana to the north of the city was occupied by Bobo or Bozo five hundred to six hundred years before Jenne (Archives de l'I. F. N., letter XV/5, reproduced in Evrard 1977, I: 134-135).

Ba and Daget (1962) and Brown (1969) collected many traditions about the effects of the wars prior to the establishment of the so-called Caliphate of Hamdullahi by Séku Amadou and of the later wars conducted by al-Hajj Umar

and the Tukulors. These are important because both leaders had active policies of forced resettlement of untrustworthy populations, and Séku Amadou in particular attempted to change radically Fulani society by demanding that every head of a nomadic family keep a residence in a permanent village or lose pasturage and water rights.

Large numbers of Rimaibe (serf-slave) agricultural villages were established as a consequence, and in many cases long-established villages may have been repopulated with captives (Brown 1969: 133-137; Ba and Daget 1962: 76, 79; Daget 1948: 31). Even during the period of Séku Amadou's most vigorous expansion, Bobo and Marka villages to the south of Jenne were destroyed by Bambara raiders (Ba and Daget 1962: 141-145). Séku Amadou resettled Bambara prisoners, often as free men, in the Jenne region (Ba and Daget 1962: 147). It should be emphasized that the region near Jenne surveyed in 1977 was considered part of the heartland of the Caliphate (along with the Massina, Sebera, Kunari and Femay); population was dense and, during the early Caliphate, the non-Fulani population liked the state policy of protecting villagers and herdsmen against the Bambara raiders, maintaining secure trade routes and dispensing justice equally (unknown under the independent Fulani ardo) (Brown 1969: 58-59;62). Our informants were in principal negative about the effects of this period; Séku Amadou is not remembered fondly in Jenne, even by the Fulani, because of his dislike for the learned of the city and his harshness towards the city upon coming to power (but see references to the great wealth of Jenne at the time in Ba and Daget 1962: 156-157). Even less fondly remembered are the Tukulor, who are accused by everyone of pillaging and burning every village between Jenne and Dia (Daget 1948: 31-32). It should be remembered, however, that most of the informants of Brown, Ba and Daget, and ourselves in 1977 were Fulani, the particular targets of the Tukulor.

The ethnic composition of the Inland Niger Delta appears always to have been fluid. However, general political instability reigned more-or-less uninterruptedly for three hundred years before French penetration in 1893. Patterns of settlement distribution established before the Moroccan invasion of 1591 would, therefore, probably have been seriously disrupted by the time the first rudimentary census data became available in the first and second decades of the present century. The intensity of the disruption has probably been overestimated by historians generally and we must not forget that Jenne, unlike Timbuktu and Gao, had a vast and rich agricultural hinterland to sustain it even during the most difficult days. The disruption is enough, however, to prevent us from making very specific analogies between the distribution of ancient sites and the modern distribution of villages and ethnic groups over the different landforms of the Inland Niger Delta.

CHAPTER 3

THE LATE PLEISTOCENE AND HOLOCENE GEOMORPHOLOGY OF THE UPPER INLAND NIGER DELTA

Landforms in the upper Inland Niger Delta (Maps 3.1 and 3.2).

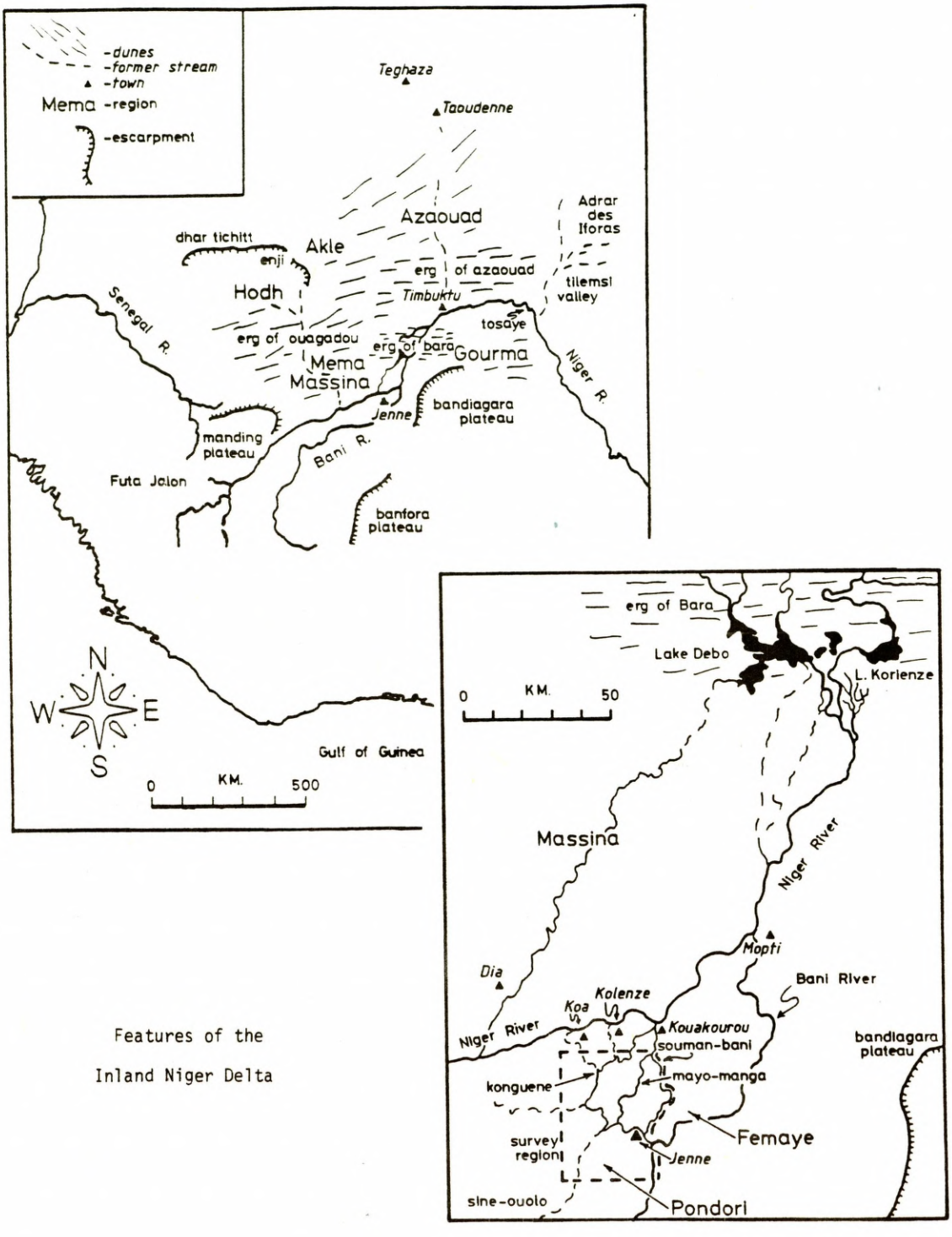
The evolution of landforms in the region surveyed in 1977 was complex and can be reconstructed only provisionally. This chapter will begin with a description of the geomorphology and soils of the 1,083 square-kilometre area to the north and west of Jenne. In the second and third parts, features of this area will be correlated with features and geological events identified in the better-studied Senegal and Gambia River valleys, the Lake Chad basin, and localities in East Africa. The second section will provide some absolute dates for the sequence described in the first.

Modern agricultural and pastoral uses of different parts of the upper Inland Niger Delta will be only briefly mentioned here in order to illustrate soil types. These land uses will be discussed in detail during the analysis of distribution of ancient settlements found during survey.

The underlying rocks of the upper Inland Niger Delta are everywhere covered by a deep mantle of Paleozoic sandstones and Quaternary alluvia. The granitic and gneissic pre-Cambrian Basement Complex is part of the ancient West African craton. Crystalline rocks of this Complex were subject to repeated planation processes during the Paleozoic and Mesozoic. The upper Inland Niger Delta is in the southern part of the Taoudeni Syncline, one of the largest geosynclines in the world. The sequence of Paleozoic rocks has been incompletely studied in its southern part, where outcropping is less dramatic than in its northern and eastern parts (cf., O. A. U. 1967: Plate 7, and pp. 5 and 6 of the 'Geology' text). The sequence of the platform cover has been reconstructed as: A) basal conglomerates and coarse sandstones, possibly of pre-Cambrian age, above the craton (10 to 200 metres in depth in the survey region), B) several possibly infra-Cambrian sandstones outcropping locally only at some distance: i) fine-grained Sikasso sandstone (0-150 metres), ii) reddened Sotuba sandstone (100-200 metres), and iii) the heterogeneous Bobo-Dioulasso sandstones, with variable mica, clay and limestone content (100-400 metres), C) the compact Toun Schists, dated to the Eocambrian (greater than 1,000 metres in places), D) the clayey Lower Paleozoic Koutiala Sandstones, and E) the Lower Paleozoic Bandiagara Sandstones, which contain more silicates than the preceding and which grade into quartzite locally (several hundred metres deep) (Palausi 1959; Choubert and Faure-Muret 1971: 277-279; and Tricart 1959: 334).

The Bandiagara Sandstones weakly emerge from the recent alluvium more than forty kilometres to the east of the survey area (beyond the San-Mopti motorable road) and form the picturesque Bandiagara Cliffs at the southeastern edge of the Taoudeni Syncline. Bandiagara and Koutiala sandstones also emerge

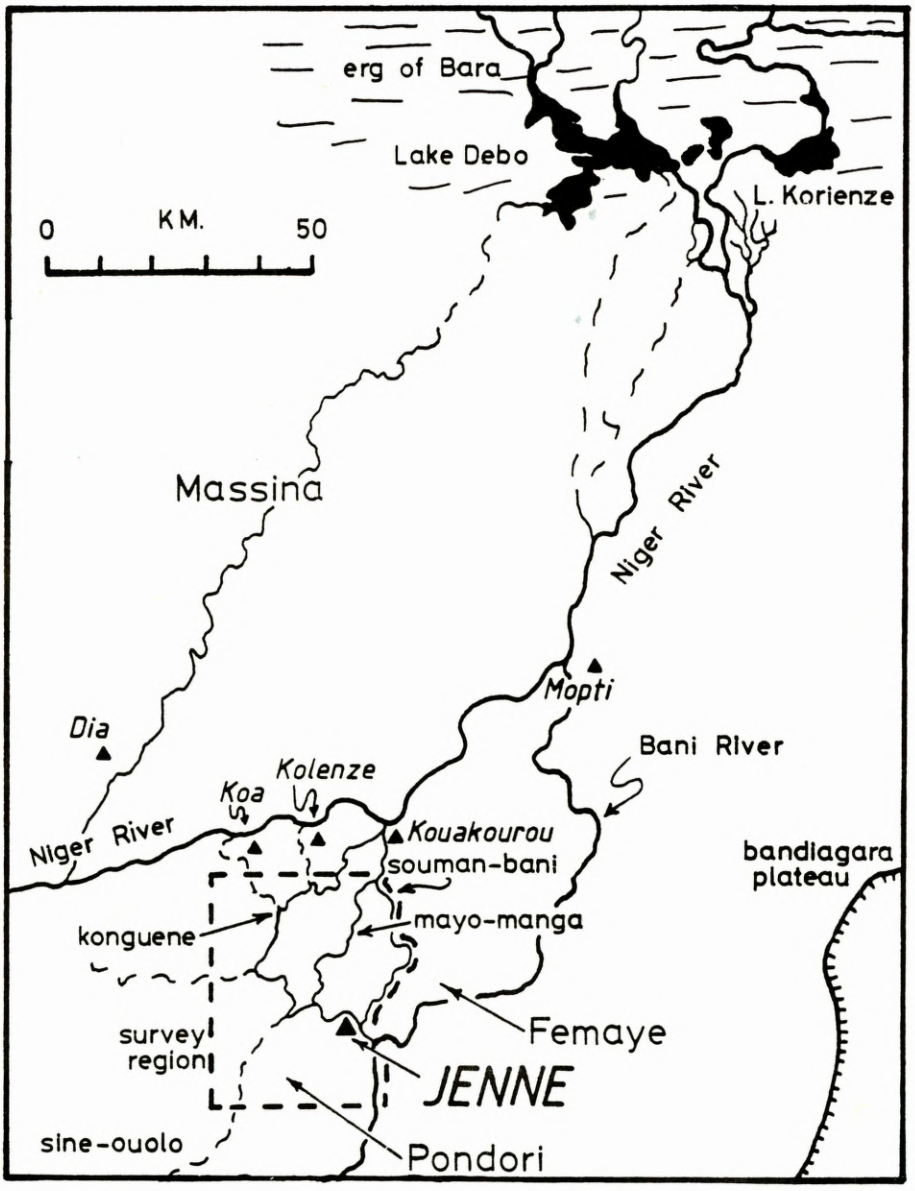
MAP 3·1



Features of the

Inland Niger Delta

MAP 3·2



Upper Inland Delta

through the alluvium near Lake Debo to form the Mountains of Goundourou and the hills of Debo, and to the west they form the Goundam-Niafunke chain. In the Massina, the western half of the Inland Niger Delta, well-shafts show these sandstones at approximately twenty metres below the surface (Urvoy 1942: 28). The relatively-resistant Bandiagara Sandstones are tabular and only very slightly warped. They possess a (red) iron content useful for determining the origin of descendant material in the neighbouring alluvial basin. The Toun Schists emerge in the left-bank lake district and in the Gourma region. These contribute illite clays to the interior of the alluvial basin (Tricart 1965: 17). The earlier members of the platform cover emerge only upstream of Bamako and at the Tosaye threshold downstream of Timbuktu.

The upper Inland Niger Delta is possibly a tectonic basin but, to date, trends of faulting and subsidence have been suggested rather than documented (Macleod 1973: 5; Daveau 1966: 405; Tricart 1965: 25-27). Documentation of fractures may be important to the future well-being of local populations as fractures may bound reservoirs of usable ground water or may be channels for the outflow of such reservoirs (Macleod 1973: 6).

Late Quaternary subsidence may have made an important contribution to the fluvial evolution of the survey region and will be discussed below when discussing the putative paleo-Lake Debo (cf. Bertrand 1975: 134).

Fractures and faulting in the Inland Niger Delta are believed to reflect the orientation of the Bandiagara Sandstones, which dip gently westward from four to eleven degrees and which strike to the north-northeast near the upper Inland Delta and to the east further north. In that part of the Bandiagara Plateau immediately east of the survey region, master sets of joints strike 30° northerly and 130° easterly (Aghassy 1970: 288, 296).

Urvoy and Tricart conducted major studies of the Quaternary deposits of the Inland Niger Delta in 1935-1937 and 1957 respectively. Earlier geomorphologists were more interested in tracing the course of the Niger River to the edge of the Sahara and neglected the upper Inland Delta. The monographs of Urvoy (1942; cf. NEDECO 1959: 289-290) and Tricart (1965, cf. 1959) were intended for use by development technicians and planners of the 'Office du Niger', who were to undertake the most ambitious irrigation scheme of colonial French Africa in the Canal du Sahel (Fala de Molodo) region of the Massina. Since these studies, however, researchers in Senegal and Chad have accurately dated landforms which both Urvoy and Tricart had recognised as related to features in the Inland Niger Delta (cf. Grove and Warren 1968: 198-200). No younger geomorphologists have since travelled to this area to document the correlations and to revise their predecessors' chronologies (cf. Bertrand 1975: 134-137 and Table 1).

The other sources used in the present study are the Carte de l'Afrique de l'Ouest au 1:200,000 (Niono, Ke-Macina, Mopti and San sheets), published by the Institut Géographique National, Paris (topographic sheets of forty-metre contour interval, 1955-1956) and stereographic aerial-photograph coverage of the survey area (Mission 70 AO 891-500, nominal scale of 1: 50,000, 1970). Satellite imagery proved useful: A). Skylab G40A057237000 (colour infra-red positive, 1 January 1974) and G40A058237000 (colour positive, 1 January 1974),

and B) Landsat (8) 1529-10082-5 (Band 5 black-and-white print, 3 January 1974), (8) 1529-10075-5 (Bands 4, 5 and 7 positive, 3 January 1974), and (8) 2075-09593-5 (Bands 4, 5 and 7 false-colour print, 7 April 1975). Features were identified directly in the field using aerial photographs.

The region surveyed in 1977 lies within the southern half of the upper Inland Niger Delta (the 'Segou Basin' of Urvoy) (Gallais 1967, I: 43). The upper Delta is bounded to the east and southeast by the Paleozoic sandstones of the Bandiagara and Banfora Plateaux. Between the Plateaux and the actively flooded plains of the Bani and Niger Rivers is a narrow ribbon of late Pleistocene alluvia. These are clays of levees and deltaic fans put down when the Bani was more actively feeding the now-senescent lakes of the right-bank lake district (e.g., Lakes Hogonadou, Nangaye, Do and Haribong) (Tricart 1965: 25, 74). These alluvia are made of clays, of fine, and of silty sands alternating with local fans and sheets of sands from the Bandiagara Plateau. They may be slightly laterized locally (Macleod 1973: 2).

The southern border of the upper Inland Niger Delta is formed from a planation surface and the now elaborately dissected region of late Tertiary ('Continental Terminal') and Lower Quaternary deposits. These are old clays and detrital loams derived from the schists, granites, dolerites and covering sandstones of the Manding Plateau to the south (Urvoy 1942: 28, 56-57). The 'Continental Terminal' deposits were formed into erosion surfaces in the Pliocene, upon which lateritic crusts (bauxite and iron) formed in the late Pliocene. A further set of three stepped terraces formed during the early Pleistocene, the first two of which were capped by duricrusts (Michel 1973: 657; Grove and Warren 1968: 198-199). To the southeast of Segou, between the Niger and Bani, these form low hills under 350 metres in elevation and are today intensively cultivated by the Bambara (O. A. U. 1967: 'Geology' text, 5). There these are capped in places by somewhat-resistant lateritic crusts covering silty fluvial or lacustrine material with ironstone concretions (cf. Tricart 1965: 150). These deposits may have been laid down in a moister environment, when the plateaux upstream were better drained and when this region was a lake or series of settling pools distant from the main river channel.

The dissection of the crusts shows well on satellite imagery. The crusts are a darker tone than the light loam exposed below. Bambara villages show as a dark spot in a wide concentric ring of light-coloured cleared and cultivated land, from which extend paths and radial alignments of peripheral fields. Occupation is particularly dense on the left bank of the Bani between the river and a dead ancestral course of the Bani.

Satellite imagery also shows dense occupation and more extensive clearance of the land in the 'dead delta' to the west of the Diaka distributary of the Niger. This is the area in which Szumowski found an abundance of ancient sites (Szumowski 1957a). It extends to the massive northern dunal system (the Erg of Ouagadou). The clays of this region were laid down by a succession of migrating courses of the Niger, which now exist as remnant tree-margined ponds and subterranean aquifers (e.g., that beneath the Fala de Molodo draining into the Hodh depression) (Urvoy 1942: 95). These deposits have recently been covered by shallow sheets of windblown sand. The plain is less than ten metres higher than the 'live delta', the inundated upper Inland Niger Delta. This sea-

(Michel 1973: 30, 667-671). Deposition of clayey sandstones from erosion of Sotuba and Koutouba sandstones of the Manding Plateau paralleled the laying down of 'Continental Terminal' deposits in the middle Senegal Basin. As in the Senegal Basin, these were given a thick ironstone crust during the long humid period of the upper Pliocene and then were deeply incised by the river during the Quaternary (Michel 1973: 671, 682, 767; 1967c: 396). From later in this humid Pliocene and early Quaternary phase dates an accumulation of debris atop the post-Eocene 'Continental Terminal' of both basins. This accounts for the low hilly relief, only slightly fixed by laterite, found immediately to the south of the region surveyed in 1977.

The lower and middle Quaternary was a time of long, but marked climatic fluctuations. These are manifested in the upper Senegal Basin as a series of three erosion terraces. The highest is dated to just under one million years and the youngest to the Würm I. The land was slowly uplifted throughout. During the long sub-arid times rains were rare but violent, and large river courses were scoured. In humid times, guinean or southern sudanese climates prevailed. The transported material was chemically altered and iron oxides w were concentrated in the upper five metres, where thick iron crusts developed over the two oldest terraces. It is though that marine transgressions coincided with humid periods (Michel 1973: 671-674, 684, Table 37). Good radiocarbon dates are available only for a late transgressive-humid period, the Inchirian (+8 metres beach) (and only for its Middle and Upper parts dated at 39,000-37,500 and 32,000-31,000 b. p.) (Faure and Elouard 1967: 784-785; cf. Hébrard et al., 1971: 303, Table).

These humid times were followed by the major late-Würm marine regression (c. -120 metre) coinciding with a dry period which has been recognised from the west Atlantic coast to the Nile Valley. Plains of distinctive parallel ergs were constructed from the Atlantic to the Qoz of Sudan (Burke et al., 1971; Grove and Warren 1968). At the beginning of the rapid regression, the Senegal and Gambia deeply incised their beds. The Senegal cut down to c. 28 metres below present sea level at Richard Toll (Michel 1973: 27; 1967b: 859, Fig. 6). The parallel dunes were erected during the period of c. 21,000 to 15,000 b. p. The dry period and major dunes are labelled 'Ogolian'. The dunes were created by the reworking and short transport of river deposits. These are oriented NE-SW and are found as far south as the Gambian-Senegalese frontier and in areas to the west now submerged by the sea (Erg du Trarza) (Beaudet et al., 1976: 162; Dubois 1967: 367; Elouard 1967: 829). In western Senegal the dunes can be tens of kilometres long, thirty metres high and separated by two-three kilometre wide interdunal depressions. Dune belts invaded the lower Senegal Valley; the main obstruction lay at Kaedi, but related sands were deposited between Bakel and Matam during maximum aridity. The Senegal was blocked and deposited thick lacustrine clayey-sands in the middle valley. The weakened Gambia apparently still reached the sea. Vegetation was severely reduced, so the diminished but violent rains caused appreciable gullying of the dunes (Hébrard et al., 1971: 303).

There is some evidence that all parts of the Senegal-Mauritanian coast did not emerge simultaneously at the end of the Ogolian regression after its maximum at c. 20,000 b. p. Coastal deposits in the north seem appreciably older

than those of similar altitude in the Casamance (Faure et al., 1974: 92). There is much other evidence that the African coasts were somewhat unstable and that beach levels can be correlated over long distances only with some difficulty (cf. Davies 1971: 200).

A new marine transgression coincided with a well-documented wet phase at c. 12,000 to 7,000 b.p. The Senegal cut through the Ogolian dunes while the sea level was still quite low. The Senegal and Gambia incised the clayey-sands of the preceding period. The Ogolian dunes were fixed by vegetation and the upper several metres were coloured brown-red by translocated iron oxides. From this they obtained their intra-continental label, 'red dunes' (Michel 1973: 27; cf. Burke et.al., 1971: 4). The wet phase is documented by lakes across the southern Sahara. The northern Sahara was arid, however, just as it had been humid during the previous Ogolian.

A short but significant dry period followed at c. 7,000 b.p.. Some believe this simply cut a 'pluvial' in two parts (cf. Michel 1967c: 401). The red dunes were locally reworked and smaller dunes oriented NNE-SSW overlay them obliquely. A similar phenomenon is seen in the western Aouker of the Hodh depression of Mauritania and in the Erg northwest of Lake Chad.

The following coincidence of transgressive sea and humid climate, the Nouakchottian, is now well-recognised on the Atlantic coast (i.e. the 'Mellahian' of the Moroccan coast, a regional facie of the global Flandrian) (Beaudet et al., 1976: 169). The sea began to rise at about 6,000 b. p. and invaded the lower Gambian and Senegal valleys (to 250 kilometres inland in the latter). The maximum can be dated to around 5,500 b. p. and the beach is only about +1 metre above present sea level at the Senegal coast and perhaps up to +2 metres in other areas. Correlations of these beaches down the coast was made difficult by continued local isostatic changes. The rising sea interfingered the red dunes. Sand from these were worked into beaches characterised by abundant remains of Arca senilis, Tympanotonus fuscatus, Dosinia isocardia, Cardium edule, etc. (Elouard 1967: 826). Evidence of the associated humid environment are remains of mangrove vegetation (Rhizophora) in old lagoons (Michel 1967c: 403). This period was never so wet as that at c. 10,000 b. p. however.

A short digression on the past datings of the Nouakchottian Transgression is appropriate because of its relevance to correlations with Inland Niger Delta (cf. Grove and Warren 1968: 194-195; Elouard 1967a: 822-824). The "plage à Arca senilis" was described by A. Dereims as early as 1911. Monod and Blanchot writing in the 1940s and 1950s agreed upon a Flandrian date. J. Dubois and J. Tricart (1954) identified a beach of between +2 and +5 metres from Nouakchott to Saint-Louis, but dated this to the Eemian. Tricart later substituted the term 'Ouljien' for Eemian, but the date of between 100,000-75,000 b. p., was retained. The red dunes were clearly older than this beach and were tentatively dated to the Riss (c. 150,000 b. p.). Tricart also dated the younger, yellow dunes of the western Atlantic coast to a pre-Flandrian dry phase. Tricart then applied these dates to features he correctly identified as analogous or identical in the Inland Niger Delta (Tricart 1965: passim). It was not until the mid-1960s that radiocarbon dates were obtained by Nydal for shell from the Nouakchottian beach. A +3 metre beach (dated to c. 5,500

b.p.) is now recognised at many points on the African coast (Davies 1971: 200). There was also a world-wide improvement of climate at that time (Elouard 1967a: 828). Few remains of human settlement on the coast predate this event; during and after 'neolithic' sites, large kitchen middens (Kjokkenmoddinger) and cemeteries abound (Hébrard et al., 1971: 303).

As the sea slowly dropped to its present level, swells and north-south currents formed a series of barrier beaches at the recently exposed coast. These dated to between 4,000 and 1880 b.p. (Michel 1973: 28). The Senegal River built a system of high levees in its actively-modelled floodplain. Its delta was elongated and branches and distributaries were rapidly formed and abandoned. The river meandered extensively. The climate became progressively less humid and perhaps at the beginning of the present era was slightly drier than today. There is ample evidence of aeolian activity: soon after the coastal dunes were erected, the wind formed small 'yellow dunes' in the sands (Michel 1973: 28). More recently, parabolic dunes were formed over the barrier dunes. Successive deltaic mouths of the River Senegal were blocked off, forcing the river to the south-southwest where only recently it assumed its present mouth in an estuary south of Saint-Louis. Similar littoral dunes were erected on the Mauritanian coast (Beaudet et al., 1976: 162-163).

The evidence for humid conditions before c. 3,000 b.p. is good from the central and southern Sahara. In the Mauritanian desert, coastal 'neolithic' groups occupied previously inhospitable tops of dunes (Charbonnel and Barbey 1972). Then the climate declined and the load of the Senegal (and Niger) River declined. Dry conditions were partially relieved in the "Middle Ages" (Michel 1967c: 403). Dunes were partially fixed by vegetation and the western Aouker and Trarza dune cordons shows sign of stream erosion. There is also some evidence of recent cultivation of millet in areas now well north of the rain-cultivation zone.

Recent work on the geomorphological sequences of the western and central Sahara has not been as detailed as that on the western Atlantic coast. Advances have been made on lake-level chronologies (Faure 1966, Chamard 1972), which have been compared to East African data. Many researchers have turned from studies of landforms to the reconstruction of late Quaternary palaeoecologies and meterological patterns (cf. Maley 1977; van Zinderen Bakker 1976; Talbot and Délibrias 1977). The reconstruction of past mechanisms of weather and their correlation with world-wide events are complex fields beyond the scope of this chapter.

Many of the landforms recognised and dated in Senegal and Mauritania are also present throughout the Sahara and northern Sahel. These are summarised by Grove and Warren (1968: 196-198), Burke et al., (1971: 4, and Figure 2) and more recently by Beaudet et al., (1976: 163-165). The key to correlation of all sequences is the large red parallel dunes set down during the lengthy dry period (the 'Ogolian' on the coast). These are directly identifiable and often continuous in the Afar and Sebkha de Chemchane of central Mauritania, the 'empty quarter' or Majabat al-Koubra, and the Aouker and Azaouad immediately to the northwest and northeast of the Inland Niger Delta. The Erg of Ouagadou is a massive set of parallel dunes blocking the entrance of the Hodh and probably responsible for stopping the drainage of the Niger into the depression.

The dunes were preceded by an extensive humid period and followed by a shorter wet phase, during which dunes everywhere were gullied and slightly laterised. This was also a period of lake transgression (particularly at c. 10,000 to 4,000 b.p.), and most of the Sahara was well watered until c. 3,000 years ago (Faure 1966). The decline in the hydrological regime of lakes was not steady, however. Minor dunes were set down and later gullied and submerged since the 'Ogolian', indicating that there were fluctuations of climate of short period and reduced amplitude.

Archaeologists and palaeoecologists agree that parts of the Sahara were still hospitable even as conditions declined elsewhere at c. 4,000 b.p.. Levels of Saharan and equatorial lakes seem to have risen and fallen in close agreement; Lake Bosumtwi near Kumasi, Ghana, was quite high at 3,000-2,000 b.p. (Talbot and Délibrias 1977: 722). The lakes of the Mauritanian Adrar supported substantial Late Stone Age populations well into the first millennium B. C. (Munson 1968, 1976: 189-195; Chamard 1972). The mountains of the Sahara also supported rich shrub-land, elephant, giraffe and cattle during the first millennium B. C. However, the trend was undeniably one of progressive desertification with minor, short oscillations of climate. Conditions may have been somewhat drier and hotter in the 12th-13th centuries A. D. after a minor humid period at c. 1000 (?), at which time millet could be grown in the central Mauritanian plateau (Chamard 1972: 6; Talbot and Délibrias 1977: 723). Conditions may also have been temporarily wetter in the 17th and 18th centuries.

The evidence from perhaps the best local sequence, Dhar Tichitt, indicates that the rains decreased only at about 4000 b.p., when a 30 metre deep lake still existed (Munson 1976). Conditions declined rapidly from c. 4000-3500. Then a second 15 metre and much more brine-filled lake was established from 3500-2900 b.p., after which date only shallow ponds and marshes remained. Desert conditions have prevailed since the mid-first millennium B. C..

The Chad Basin ranks with the Senegal-Gambian River Basins as one of the better understood parts of sub-Saharan Africa. Details of the sequence of sedimentation here are somewhat less confused by uplifting and subsidence. The basic chronology summarised by Grove and Warren (1968: 200-203) and more recently by M. and S. Servant (1970: 74, Figure 7, 1972) is now widely agreed upon. In particular, researchers in this area have collected some of the best information available on lake levels and climatic change within the last millennium and have used this information to reconstruct the palaeoecology of the Basin during the major climatic phases of the late Quaternary (Maley 1973 and 1976; Servant and Servant 1972).

The Chad Basin is a relatively recent artefact of folding of the granitic-gneiss shield (with associated volcanic intrusions), beginning in the Cretaceous and ending in the upper Pliocene and early Quaternary (Servant and Servant 1973: 169). In late Tertiary and early Quaternary times wide erosional plains formed on the flanks of high residual hills and the basin itself was filled with fluvial clayey-sands and sands (from 0-400 metres deep). The erosional plains were later slightly laterized, as were analogous features in the Senegal and Niger Basins. Very thick dune sands date to before c. 41,00 b.p., indicating a very extensive period of erg formation before high lake transgressions at 41,000-38,000 and 30,000-22,000 b.p. (Servant and Servant 1972: 87-88).

Strong evidence of these lakes remains at an altitude of 380-400 metres in the Basin and it is perhaps during one of these periods that the delta of the Chari River covered 40,000 square kilometres. These late Pleistocene lake deposits form the 'Bahr al-Ghazal' Series of the Chad Basin stratigraphy (Servant and Servant 1973: 171-172). The present Lake Chad stands at 281-282 metres and the spillway for overflow from the Basin to the Benue Valley is now at c. 320 metres.

The two high lake stands were interrupted by one or more arid periods. None was as arid as that to follow, however. The climate was very dry from c. 20,000-12,000 b.p. (corresponding to the 'Ogolian'). Active dune fields were erected at least as far south as 11°, whereas today live sands are found only above 16°. Strong NE and N winds reworked local water-laid sands into the parallel Great Erg of Hausaland and into the broad Kanem-Manga Erg (NNW-SSE transverse dunes) now partially inundated by the present lake. These thick sands form the 'Soulias' Series of the Basin. There is also evidence in the form of silt and clay deposits between the dunes that this dry phase was interrupted perhaps several times by wetter phases, or that rainfall remained sufficient to maintain low-lying interdunal swamps during all but the driest times (Servant and Servant 1970: 66-67 and 73-75). The dry phase had ended by c. 12,000-11,000 b.p..

Very humid conditions prevailed at about 10,000 b.p. and several large and apparently independent lakes formed in the Basin. The present topography would not have allowed the lakes to remain separated, suggesting that tectonic movement of the Chad Basin has continued into the lower Holocene (Servant and Servant 1970: 70). The main lake formed a very distinct strandline and beach at the c. 320 metre level; this lake is referred to as 'Megachad'. A second strong Chari delta is associated with this lake. Lacustral and deltaic deposits of this period form the lower part of the 'Labde' Series.

At approximately 9,000-8,000 b.p. Megachad was fed by regular streams from the Tibesti and other Saharan massifs, as well as from the traditional southern plateaux. These stream deposits are unlike those of episodic storms in desert highlands and are believed to be evidence that rains were more evenly distributed throughout the year. The deltaic deposits of Angamma (S. Tibesti), from which the remains of Tchadanthropus were collected, date to this pluvial and not to the 'Villafrancian' as thought before (Servant and Servant 1970: 68).

A drier period followed at c. 7,000 b.p.. Lakes were maintained in part by groundwater seepage and a mediterranean flora could still be found as far south as Borku until 5,000 b.p.. It is possible that Megachad remained constant at c. 320 metres or nearly so until c. 5400 b.p. (Maley 1973: 175). The northern bodies of water did fluctuate greatly in size and dune sands interfinger lacustrine clays and silts north of 15°. Lakes north of 15° probably dried out completely during dry oscillations at c. 7500-7000 and c. 4000-3500 b.p. but were rewatered during minor transgressive periods at c. 5000 and c. 3500-3000 b.p. (Pias 1967: 428; Servant and Servant 1973: 175 and 1970: 65-66, 89, 73-75, 90).

After the last transgressive period at c. 3500-3000 b.p., conditions became generally as arid as the present; barchan dunes are now mobile in the northern part of the Basin. But climate has varied in recent millennia and the level of Lake Chad (now on average only 3.85 metres deep) has changed by a few metres even since records began to be kept (c. 1870) (Maley 1973: 177, Figure 2A). Parts of the southern Sahara remained hospitable until recently: remains of the tenth century iron age 'Haddadian' industry are plentiful in the Koro Toro region (Coppens 1965) and oral traditions still recall a time when elephant and hippopotamus could be hunted north of 15°.

There are remains of a c. 286m lake, the end of which has been radiocarbon dated to between the eighth and tenth century A. D. (Maley 1973: 177). The lake was low at c. A. D. 1000-1150, rose slightly at c. 1150-1300 and then fell sharply until the mid-sixteenth century. The lake rose again to perhaps the 286m level at c. 1570, where it remained until A. D. 1800. The Bahr al-Ghazal fed the Bodele depression from Lake Chad at least as late as 1790-1800. Parallel trends have been recorded for the Nile River and East African lakes (Maley 1973: 180; Butzer et al., 1972). The level of Lake Chad has fluctuated strongly during the past one hundred years (e.g. a two metre fall within ten years at the beginning of this century), but this generally has been a regressive period. The effects of climate and man are as severe on local vegetation now as they have been in several millennia. Records of climate and lake levels indicate that lower temperatures encourage more rains and lower evaporation, resulting in higher lakes. Maley feels that cold winters in the southern hemisphere push the summer monsoons north (rather than high summer temperatures in the northern hemisphere pulling the Intertropical Convergence Zone) (Maley 1973: 180-181; cf. 1977). Thus the high lake level at c. A. D. 1570-1800 would correspond to the global 'Little Ice Age' and the lake fall of c. A. D. 1000 would be related to warming trends recorded worldwide.

Comparisons between these southern Saharan sequences and the East African evidence have intrigued researchers for over a decade (e.g. Burke et al., 1971: 6; Grove and Warren 1968: 203-207). Before these detailed comparisons were made, researchers had looked for sub-continental agreement according first to the now-discarded Pluvial-Glacial theory and then to the theory that events in northern Africa were a reverse reflection of those south of the Sahara. As of this writing the evidence and dating of East African geomorphological sequences are still not as detailed as those for the Senegal-Gambian River Basins, the western Atlantic coast and in particular the Chad Basin. Recent work in the upper Nile Valley, on the shores of the Rift Valley lakes (especially Rudolf and Nakuru) and the Afar region of Ethiopia will soon right the imbalance. The evidence from equatorial and southern Africa is more incomplete.

The large reddened parallel dunes of the Qoz of the Sudan Republic can be directly correlated with the red dunes seen in many localities from the Atlantic coast. Grove and Warren (1968: 203-205) have summarized the geomorphology of that area and recent work has served to further confirm that the same broad climatic trends prevailed there. Interest has also been centred on the newest evidence from those Afar and Rift Valley lakes lacking outlets (Abhe, Naivasha, Magadi, Rukwa, in addition to those mentioned above). East African lake

comparisons indicate that conditons today are relatively dry and lakes are quite low, but that far more arid conditions prevailed between 21,000-12,500 b.p. (Butzer et al., 1972; Street and Grove 1976: 386 and 1979). The fourteenth millennium b.p. probably marked the minimum for lake levels throughout Africa. The evidence of prior high levels is less decisive, but all were clearly before c. 20,000 b.p.. Lake transgressions began again at c. 12,500, reaching the Holocene highstand at 10,000-8,000. There was a possible minor interruption in the rise at 10,500. In their studies of all African lake basins, Street and Grove found that 18 of 20 basins with sufficient evidence showed maximum levels at 10,000-9,000 (with a possible peak at 9,000 in some) and each of 31 data points for the 9th millennium showed maximum levels (Street and Grove 1979 and 1976: 386-387; cf. Butzer et al., 1972; van Zinderen Bakker 1972). The East African lakes declined slightly at c. 7500 and then recovered at somewhat less than maximum between 6500-6000 b.p.. Afterwards the mid-late Holocene fluctuations were the rule: lakes rose somewhat at 4800 and 3500-3000, after which the present dry regime was established, and then rose to a lesser level at c. 2100-1500 b.p., 1200-1000 b.p. and after A. D. 1600. Minor oscillations occurred at approximately one hundred year periods during the past two millennia. Since c. 8000 b.p. periods of lake contraction were longer than those of expansion. The evidence of the Nile Valley has been less widely agreed upon both because of uncertainty whether the valley morphology better reflects the climate of the river valley or the headwater regions and because of disagreement upon conditions under which individual deposits were formed (e.g. the silt aggradation of the late Pleistocene). Issues have been confused by the fact that at some times the Nile Valley seemed to display northern Saharan rather than sub-Saharan and East African characteristics. More recent interpretations are more in line with those for the rest of sub-Saharan Africa during the Holocene (Wendorf et al., 1970 and 1977; Rognon 1976a).

Transcontinental comparisons of lake levels and geomorphology are in a formative period and comparative reconstructions of palaeo-climates and palaeoecologies are still in their infancy. Rognon (1976b) summarizes the strengths of the various classes of data which are used in these comparisons, to which one should add the serious cautions that an insufficient number of geological sections have been studied and that most radiocarbon dating has been made on samples of freshwater shell and calcareous deposits — scarcely the ideal material. Nevertheless, researchers agree that the basic chronology of late Pleistocene and Holocene climates will withstand more detailed field studies and that these sub-continental parallels of climate could only be caused by global dynamics of the atmosphere and oceans (Rognon 1976a; Street and Grove 1976 and 1979; van Zinderen Bakker 1972 and 1976; Maley 1977).

These sub-continental trends are also being compared to the more detailed glacial sequences of the higher latitudes. And while these comparisons and recent incursions into global meterology are outside the scope of this chapter, mention might be made of promising attempts to reconstruct past climate in Africa by extrapolation from parts of the world with formal meterorological data of more historical depth (cf. Rognon 1976b: 153-155). For example, Winstanley (1973) has found that rainfall in the Sahel and England are positively correlated on 20-year averages during the present century (it should be noted

that his results are not universally accepted). Extrapolating back 1000 years, he suggests that a northward shift of the monsoonal summer rainfall zone would have caused greater precipitation than today during several centuries before A. D. 1200 (with a significant rise at c. 1100) and again from A. D. 1700-1930. The reverse conditions are suggested to have occurred from A. D. 1300-1700 (with a major decrease from 1300-1400) and again since 1930. These exercises in extrapolation must not be applied uncritically to separate areas like the Niger River valley because of lack of information about temperatures (affecting evaporation), disturbances of individual hydrological systems (e.g. by damming dunes) and the even less tangible changes in global weather mechanisms which have produced major shifts in correspondence of climates between different areas throughout the Quaternary.

The basic outline of late Pleistocene-Holocene climatic chronology, condensed from the preceding discussion, follows. Features of the sequence seen in the upper Inland Niger Delta are correlated with this chronology in the final section of the chapter. When compling this chronology the most weight was given to the evidence from the Senegal-Gambian Rivers and Chad Basin sequences. This is both because of their geographical proximity and because all three regions represent extensions into the Sahel of hydrological systems having their contributory head waters in the better-watered highlands to the south (cf. Street and Grove 1976: 389, Figure 6; Butzer et al., 1972: 1074, Figure 3; Rognon 1976a: 274, Figure 7 and 276, Figure 8; Wendorf et al., 1977: 231-232; Burke et al., 1971: Figure 2; van Zinderen Bakker 1972: 22, Fig. 2).

A. c. 40,000 to 20,000 b.p.: Long Humid Period: Conditions were on the whole quite humid and if some drier periods occurred, they may have been of long period but reduced effect. Active watercourses are found north and south of the Sahara. 'Continental Terminal' and lower Quaternary deposits are extensively eroded and their surfaces slightly laterized. Great lakes formed in the southern Sahara, Sahel and eastern Africa. Basins were filled with thick deposits of unconsolidated and relatively well-sorted materials. The dating of individual events is difficult (in Europe: Würm II-III Interglacial) (cf. Rognon 1976a: 252-258).

B. c. 20,000 to 12,500 b.p.: Extreme Aridity: Deserts and semi-deserts expanded approximately 450 kilometres to the south and the plant cover was reduced everywhere. Strong winds (generally NE to E) erected major dune fields of nearby water-sorted sands. These often blocked the few remaining seasonal rivers. Most watercourses were ephemeral. There is some evidence of wetter fluctuations in the form of clay interdunal deposits, and lacustrine deposits can be found behind dunes blocking the seasonal rivers (e.g. the Senegal). African lakes were at their lowest levels in the 14th millennium and Lake Chad disappeared altogether. However, there is evidence of lakes in the Tibesti and Jebel Mara at 14,000 and 16,000 respectively. At the end of the period, rainfall increased enough to gully the dunes before vegetation recovered. Assuming at least a 3°C. decrease in temperature, precipitation in the Sahal was c. 15-20% of present and 54-90% in East Africa (in Europe: Würm III) (cf. Rognon 1976a: 258-264; Street and Grove 1976: 387-388).

C. c. 12,5000 b.p., Holocene sub-Pluvial Conditions: 1. c. 12,500 to 10,500 b.p.: Moderate humidity led to a slow restoration of vegetation cover and lake levels. Dunes were stabilised and began to be reddened. A semi-desert grassland and thorn savanna covered most the Sahara. Strongly seasonal or newly-permanent rivers incised barrier dunes and lacustrine deposits. Braided streams developed (in Europe: Late Glacial) (cf. Rognon 1976a: 264-265; Street and Grove 1976: 388; van Zinderen Bakker 1972: 18-19).

2. c. 10,500 to 10,000 b.p.: During a minor dry phase, rivers again became seasonal and lakes regressed or rises were interrupted (in Europe: Younger Dryas-cf. Rognon 1976a: 265; van Zinderen Bakker 1972: 22, Fig. 2).

3. c. 10,000 to 8,000 b.p.: In the early Holocene 'Pluvial', increased rainfall supported high lake levels and lake networks were large and often interconnected. Active perennial rivers cut across the southern Sahara and Sahel. Watercourses originating in the Saharan massifs contributed to Sahelian rivers for the final time. Streams with great loads of suspended sediments meandered extensively. Biological activity of the Sahara was greatly increased and aquatic fauna expanded widely. Relict desert areas were isolated from one another by swampy wadis supporting gallery forests (in Europe: Preboreal and Boreal Interglacial) (cf. Rognon 1976a: 265-266 and 268-271; Street and Grove 1976: 388).

4. c. 8,000 to 7000 b.p.: During a brief but marked arid period lake levels fell or were only just maintained by groundwater. Aeolian activity increased; deflation basins were created and 'red' dunes were locally reworked. Nevertheless, a mediterranean flora of the previous period was still found as far south as Borku. Runoff from the Saharan massifs began their progressive decline (cf. Rognon 1976a: 266, 271).

5. c. 7,000 to 5,000 b.p.: During a return to a slightly less humid 'pluvial' time, lakes again rose and surface water was abundant in the form of standing ponds and full wadis. Saharan watercourses never recovered completely, but became seasonal braided streams. Major rivers were perennial (in Europe: Atlantic) (cf. Rognon 1976a: 271).

D. c. 5,000 to 0 b.p.: Progressive Decline to Present Conditions: This phase in characterised by fluctuations of short period and low amplitude. In the early part Saharan lakes were still quite high and the mountains maintained a large mammalian population. Massif streams were strongly seasonal, but dried completely for several months. Sahelian rivers meandered somewhat and carried a heavy or moderately heavy load. Later Saharan river systems became active only after individual storms and no longer carried significant contributions to the Sahelian rivers. Dunes may have become locally active and alluvium in dry wadis was reworked by periodically strong winds. Overgrazing and overcultivation may have increased that tendency today. Lake levels declined at c. 4,000-3,500 and after 3,000; at these times lakes above 16°N. may have dried out completely. Conditions may have improved slightly before c. 500 B. C., but became drier than today at c. 0 A. D., and again slightly improved before the 13th and again in the 16th to 17th centuries A. D. (in Europe: sub-Boreal and sub-Atlantic) (cf. Rognon 1976a: 272-277; Street and Grove 1976: 388).

Tentative Summary of the Evolution of the upper Inland Niger Delta

Prior to 40,000 b.p.: The 'Continental Terminal' and lower Quaternary deposits near Segou and the Bandiagara Plateau to the east were subjected to planation processes. In the former area three stepped terraces were formed in the early-middle Pleistocene, the first two of which were covered by lateritic crusts. The basin of the Inland Niger Delta presumably was partially filled with debris during each episode of planation. This unconsolidated material deeply covered the bedrock of Paleozoic platform cover.

A. c. 40,000 to 20,000 b.p.: The Niger and Bani maintained separate courses. The Bani deposited deltaic fans to the west of the Bandiagara Plateau. The river actively contributed to large lakes (of which the right-bank lakes are remnants) and finally drained into a great swamp west and north of the Gourma. The Niger drained into the southern Saharan depressions of the Hodh (Aouker), Akle, and the Azaoud (Araouane). The present Inland Niger Delta was probably a low-lying settling basin. It is not known whether or not the Niger flowed below the Tosaye sill during this period.

B. c. 20,000 to 12,500 b.p.: During a long dry period the Niger and Bani probably did not flow downstream of Segou. Sorted sands of fluvial and deltaic deposits of the preceding period were transformed by the wind into local and often extensive systems of parallel dunes (ENE-WSW) and sheets of sand. The large red dune in the survey area and sand sheet northwest of it date to this period. Related, but more extensive dune systems were created in the higher latitutes, viz., the Erg of Ouagadou blocking the entrance to the Hodh, and the major ergs of the Aouker, Akle,Azaouad and the Gourma.

C. c. 12,500 to 5,00 b.p.: When humid conditions returned, the Niger and Bani found their old channels blocked by dunes and so eventually converged in the basin between their old channels. The dunes were stabilized and reddened. The Niger first flowed through the Massina, but its heavy load of sediment during the climatic optimum (c. 10,000 b.p.) caused channels to become congested and to strangle in succession from west to east. The Niger meandered extensively through the northwestern part of the survey region during the later part of this phase before its transport capabilities decreased, at which time it assumed its present low-load sinuous channel. The Bani first formed a large swamp (the Pondori) to the south of the red dune and eventually breached the dune. During a return of arid conditions (c. 8,000 to 7,000 b.p. ?) the east-west oriented Erg of Bara formed in the region of Lake Debo. Some white dunes in the survey region may date to this period. The northern Massina was finally choked by sand. When humid conditions returned, it is presumed that a shallow 'paleo-Lake Debo' covered the upper Inland Niger Delta. The lake drained when the Issa Ber and Barra Issa breached the dunes. Alternatively, the Inland Niger Delta was a greatly expanded floodplain.

D. c. 5,000 to 0 b.p.: The large 'paleo-Lake Debo; if it existed at all, may have disappeared by c. 4,500 b.p. (Nicholson 1976: 70-71). The evidence from the Niger lakes is that from c. 4,000 to 3,500 b.p. conditions were quite arid and the lakes fell considerably; this parallels evidence from the Senegambian and Chad basins (Nicholson 1976: Fig. 17, 74-75, 83-97). In the Mauritanian depressions a major arid phase descended at c. 4800 b.p. (at

4,000 b.p. precipitation was somewhat higher than today, but was characterized by short, violent storms). Rainfall at Tichitt was very low (c. 45mm) until c. 3,500 b.p., at which time the Mauritanian lakes rose briefly until c. 3,000 b.p.; by 3,000-2,900 b.p. the lakes had nearly disappeared and arid conditions prevailed, still with 'summer rains' until perhaps the first few centuries A. D. Then the Mauritanian evidence shows severely decreased rainfall until a more humid episode from approximately the ninth to the thirteenth century and perhaps again from the late fifteenth to the sixteenth century (Nicholson 1976: 51-52, 76-80; cf. Munson 1976). The Mauritanian evidence nicely parallels that from the Inland Niger Delta and, as will be seen in Chapter 6, may be critical to an understanding of the beginning of occupation in the Jenne region.

The site of Kobadi (12 kilometres from Nampala), radiocarbon dated to the eighth century B.C., was then at the margin of inundation, whereas today the edge of the floodplain is c. 80 kilometres to the southeast (Mauny 1967a: 76; cf., Posnansky and McIntosh 1976: 181). During this period the lower channel of the Bani converged with the Niger at different points. Both rivers carried enough load that convergence points were strangled progressively from west to east and intricate levee systems were created along successive generations of channels. One or more periods of dune transport contributed to the migration of channels. Material deposited by the putative 'paleo-Lake Debo' has probably been completely reworked and obscured. Recent drainage has been concentrated in fewer channels, which have begun to incise into old floodplain deposits, probably because the rivers have progressively carried a more reduced load (rather than because of assuming a new Atlantic base level). Settlement at Jenne-jeno began at a level now almost 0.5 metres below the average highwater mark (and floods now vary by as much as a metre between years). The waters rose again at c. A.D. 700 or 800 during a humid episode lasting at least until A.D. 1000 and almost certainly until A.D. 1200-1300. There was again a minor period of climatic improvement and, presumably, of higher floods as well from c. A.D. 1500 to 1750 (Nicholson 1976: 83-97, 160-161; Maley 1973: 175-181 and 1976).

The sixteenth century appears to have been the start of a phase of climatic variability which continues to the present (Nicholson 1976: 103-104, 106, 117-119, 123-157, 162 and 257-263; Cissoko 1968). It is critical to know whether or not this apparent increase in variability began before the sixteenth century or whether it is simply an artefact of the detail of information available to us in the historical sources for the first time in the sixteenth and seventeenth centuries. The increase in climatic variability included that of the period and amplitude of the annual flood, as well as that of rainfall, and has had dramatic effect upon the numbers and duration of famines and epidemics, and upon political and social instability in the Inland Niger Delta.

CHAPTER 4

GEOGRAPHY AND HUMAN GEOGRAPHY OF THE UPPER INLAND NIGER DELTA

Geography

The present climate of the Inland Niger Delta combines with the geomorphological history to create the mosaic of landforms illustrated in Map 4.1. The distribution of plant and human populations over these landforms has been studied in some detail by geographers (Bertrand 1975; Gallais 1967; Galloy et al., 1963; and Sundström 1972). It should be kept in mind that the soil and landform units used here are an expression primarily of soil composition (clay, loam, sand) and also of position within a gross relief profile (e.g. Low Plain is generally lower than Middle Plain — Loam, as well as possessing higher sand and loam fractions).

These units are not defined as 'ecotopes' or ecological niches, i.e., "an adaptive zone, representing a characteristic reaction and relationship between environment and organism, a way of life and not a place where life is led" (Hardesty 1972: 460). Less narrowly-defined geographical units are needed in the Inland Niger Delta, where violent extremes of climate transform the landscape several times a year into quite different habitats used seasonally by quite different ethnic groups. It is against these landform units that the distribution of ancient sites will be plotted in Chapter 5.

The 1,100-square-kilometre area surveyed is part of the upper and middle Jenne delta as defined by Gallais (1967, I: 32-38). It lies within the upper part of the larger Inland Niger Delta (30,100 square kilometres), which has a slope of only approximately 10 metres over 200 kilometres (approximately 3-4 centimetres per kilometre from Jenne to Sofara) (Gallais 1967, I: 9, 58). To the southeast is the principal channel of the Bani River, characterized by a sub-rectangular section and by migrating sandbars which surface only when the waters are at their lowest level (the ta_0 'ecotope', with no exploitable vegetation, as defined by Bertrand 1975: 143). When the waters of the Bani and its distributaries rise they first inundate the flood channels (Clay Channel, Sand Channel; the tb_0 (ecotope' of Bertrand 1975: 143, Fig. 3, 139). The Clay and Sand Channels are built of a series of recent levees lying parallel to the principal bed (youngest closest to the bed), separated by sediment-filled inter-levee basins, which may hold some water year-round. These levees are submerged only during exceptional floods, so one finds acacia and tended fruit trees at their summits. At the highwater mark one finds a zone of the graminaceous Andropogon gayanus. Below are mixed stands of Vetivaria negritana and wild rice, Oryza barthii. The former prefer soils submerged for fewer than three months and the latter areas flooded for three to six months. This bathymetric progression of Andropogon, Vetivaria, and

FIG 4·1

1-12=months
SECTION THROUGH A.P. 159
T▲- temporary camp
P▲-permanent village
▼ -site
| deep clay | middle plain - loam | low plain | mp-loam | heavy levee | light levee | clay channel | BANI
T p
P m+s
(e.g.159-6-A)
T bz
(e.g.159-7-B)
T p
(e.g.159-T18-A)
P b+bz
T bz
PONDORI
NYANSANNARI
- 0
- -1
- -2
- -3
(P) Pastoralism: 2-6
(M) Rice: 6-8, 11-1
(Bz) Fishing: 9-1
(M?) Arboriculture
(B) Rice: 6-8, 11-1
(B) Rice: 8-1 (maize/fonio)
(B) Hunting: 9-12
(P) Pastoralism: 2-6
(B)•Millet, Sorghum: 6-11
(maize/fonio)
(B) Arboriculture
(B) Millet: 6-10
(B) Fishing: 2-3
(B) Tomato: 2-5
(P) Pastoralism: 10-6
(P) Pastoralism: 10-6
(B) Arboriculture/Millet: 6-10
(B) Maize: 6-8/manioc
(B) Rice: 8-1
(Bz/B) Hunting: 9-12
(Bz/S) Fishing: 12-6
(S) Transport: 1-12
b-bambara
bz-bozo
m-marka
p-peul/fulani
s-somono
(vertical not to scale)

'economic' relations" In the upper Inland Delta these groups now interact with few conflicts (and with minimal supervision by the security forces) and yet they seriously overlap in the use of landforms, soils, and relief gradients, and in the time of that use during the year. A complex chain of symbiotic exchanges of labour, products and services has been established, both in situ (e.g. Fulani herds fertilizing Bambara fields in exchange for grain) and through the indirect, but effective medium of the major markets (especially Jenne). It appears closer to the fact that each group is tolerant of a certain amount of competition by another group (within limits establised by custom rather than legally), on the understanding that if the varied subsistence activities of one group are utterly defeated by the unpredictable floods, rains, diseases, locusts, or any other manifestation of the climate, then that group may fall back upon the temporary charity of a second group. Strong myths of reliance in crisis are shared by the Bozo and Dogon and the Nono and Bozo are similarly strongly allied; it may be that the principle of exchange of security has a very long history in the upper Inland Delta, and that the migration of alien Fulani and Bambara interferred with its smooth functioning until they too had had time to lose their monomaniac mentality.

Part ii

SECTION II

THE REGIONAL SURVEY

CHAPTER 5

A SURVEY OF THE JENNE REGION

Introduction

In Chapter 1 it was argued that the most effective way to investigate the appearance and development of the pre-colonial town in West Africa is not to excavate only the town site, but to document and explain the evolution of the settlement hierarchy of which the town is the summit. As a settlement becomes more urban, it is reasonable to assume, for reasons given in Chapter 1, that the inhabitants become more varied than inhabitants of smaller villages in terms of wealth, social or perhaps ethnic backgrounds, and in their personal idiosyncracies. Again, this is not to say that there is no diversity in rural villages, but rather that diversity will increase in some relationship to the position of the settlement within the hierarchy. This greater diversity will be reflected in a greater heterogeneity of artefacts and features at the urban settlement when it becomes an archaeological site.

If towns are to be studied in their regional context there are several requirements of the site surveys designed for the study of settlement hierarchies in any region (cf. Cherry, et al., 1978): 1) Techniques must be developed to locate accurately all sites of all periods and all types within the region; a scatter of lithic artefacts is as worthy of study as a large tell . 2) A sampling strategy needs to be selected, as a considerable variety of (probabilistic) sampling schemes are available to the archaeologist who is unable or unwilling to undertake a metre-by-metre search of a region. It should be stressed that the application and efficiency of sampling techniques are still very experimental and there is no widespread agreement about the details of their application (e.g. the relative efficiency of transects or quadrats, or the best size of transects). 3) Sites should be plotted against a precise map of the landforms of the region, for the landforms provide the geographical context of human settlement. 4) Accurate and standardized descriptions of the remains at sites are necessary before they can be assessed. 5) Sites, or components within sites, must be dated to within as narrow a time range as possible. The issue of contemporaneity of sites must be foremost in the mind of the archaeologist who wishes to use geographical models for the analysis of settlement data. 6) The size of a site must be known; the archaeologist should be as certain as possible that his large settlement is not simply a composite of many smaller and overlapping seasonal occupations (the problem of the 'palimpsest').

The ideal survey of settlement patterns would satisfy all of the following requirements: every type of site occupied during each period is recorded; the problem of differential preservation of sites and of remains within sites is not a concern. In an ideal survey the archaeologist would precisely date

each phase of occupation at each site and the precise date of abandonment would be known. The map of landforms in the region would also be prepared in great detail. The archaeologist must be certain of the size and density of features at each site during each period if one wishes to attempt to estimate population during each period. In order to properly analyze the changes in numbers of sites, densities of sites on different landforms and the uneven distribution of artefacts at different sites the archaeologist should possess a detailed understanding of 1) the reciprocal relationships between man and the land, of diet, settlement size, subsistence economy, and mobility of population), 2) the history and physical effects of climatic and geomorphological change, and 3) the history of neighbouring communities, because no region develops forever isolated from the effects of trade or political interaction. The ideal survey presumes prior research. It should be known, for example, which attributes of the ceramic assemblage are most time-sensative, or whether soil types rather than vegetation will isolate the most informative landforms.

Because there was so little prior knowledge of the upper Inland Niger Delta, much of the survey in 1977 was of a basic exploratory nature and its results were very far from those of the ideal survey. As reviewed in Chapter 1 (see Part i, Chapter 2) pot-hunting at Kaniana and casual and unpublished diggings at Jenne-jeno in 1937 constituted the only previous archaeological research in the region. The only other information about other sites in the area is a small unpublished map by Bedaux on which he has plotted several sites near Jenne and along the Souman-Bani (Bedaux, personal communication, 8th March, 1979). This information was collected during a survey by boat from Jenne to Mopti along the Bani, from Mopti to Kouakourou along the Niger and from thence back to Jenne along the Souman-Bani; there was no penetration of the interior of the region. The only other references to sites in the region are of limited value for the development of a programme of survey, viz., the tale of the message sent from Jenne to Lake Debo in the Ta'rikh es-Sudan (al-Sa'di' 1900: 23; vide supra).

There is also a lack of studies from neighbouring regions, with the exception of the excellent artefact sequences from Sanga published by Bedaux (1972, 1974) and the human-geographical and ethnographical work on the Inland Niger Delta populations. The results of Bedaux et al.'s, 1974 archaeological investigations of Toguérés Galia and Doupwil were not, of course, available prior to the 1977 field season at Jenne (cf. Bedaux 1976b).

Almost without exception it is archaeologists from the better-studied parts of the world who are pioneering the application and experimental testing of sophisticated sampling schemes based on mathematical theories of probability. A review of the literature (Cherry et al., 1978; Mueller 1975) shows that at all stages of the formulation and implementation of those sampling schemes, a great deal of information about the 'population' to be investigated is required (e.g. "The type of sampling design should be chosen in accordance with the researcher's goals and the particular conditions of the material to be investigated" or (when discussing data to be recorded during survey), "Awareness of the precise nature and quantity of these data allows the researcher to select his subject matter and investigatory methods carefully"

(Redman 1974: 7). The more precise and complete the prior knowledge, the more sophisticated a sampling procedure may be developed. It should not be surprising, therefore, that no one has written about the application of these probabilistic sampling methods to the search for sites in regions as poorly explored as the Jenne region. Unexplored areas do exist and this is acknowledged by authors who write about 'multi-stage surveys' in which the initial stage is one of general reconnaissance (what types of sites and what range of artefacts on their surface?) combined with geographical investigations (palaeoecology, geomorphology, etc.). "The fundamental procedure of a multi-stage design is first to investigate in a generalized manner the entire population of materials, then in each subsequent step to investigate more intensively a smaller portion of the total region" (Redman 1974: 28). The survey in 1977 satisfies most of the requirements of 'Stage One' of Redman's "Multi-stage Field Research Project" (1974: 28, Figure B, p. 29).

Despite the very serious difficulties of travel in the region, it was decided to cover an area contiguous with Jenne and Jenne-jeno, which was large enough to reduce the effects of proximity to the presumed largest settlement and which included a variety of landforms. In particular, it was important to cover an area well away from the River Bani and its main distributory, the Souman-Bani, where one could see many large sites on the aerial photographs. In the course of a linear survey, it would not be possible to establish whether large sites were only found close to these navigable bodies of water. The basic information desired from the survey was the location and nature of as many types of site as possible, their distribution and density on different landforms, and a record of features and artefacts on their surfaces. The methods of survey and recording are described fully in the following two sections of this chapter, as are the special restrictions placed on the research. The remaining sections concern the results of investigation of specific issues (e.g. distribution by landform, testing visibility of sites on aerial photography, estimating site size, and dating abandonment of sites).

Chapter 6 concerns the analysis of the results. Issues such as the effect upon the settlement patterns of changes in ethnic composition, subsistence activities and environment, the way in which settlements of this region were or were not integrated in a network of local trade, and the contribution of excavation of Jenne-jeno and survey in her environs to an understanding of how Jenne developed and of how we may refine our rather amorphous definition of urbanism will be considered there. A major concern in these two chapters is that analysis not over-step the boundaries imposed by the quality of data collected during the survey.

Survey Procedures

The surface of the Survey Region was 1,083.3 square kilometres (Map 4.1). The Survey Region is that area covered by a mosaic of twelve (and part of a thirteenth) aerial photographs. The aerial photographs were obtained from the Insitut Géographique National (Paris) (series 1970 AO 891-500 [Mali] [nominal scale, 1:50,000]):

(384)	383	381	379
	348	350	352
	295	293	291
	155	157	159

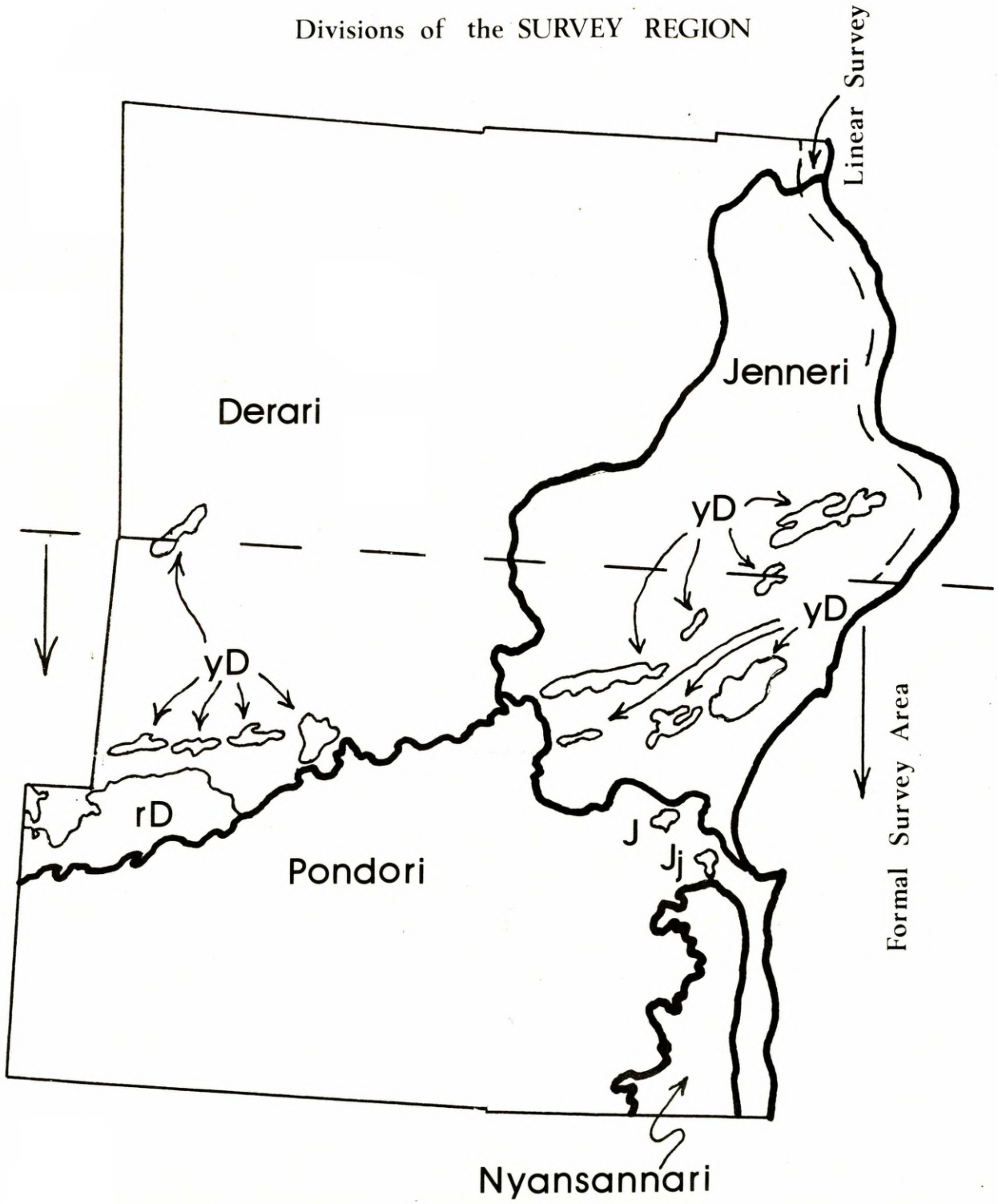
The region is composed of ten landforms and soil units, the area of each of which was calculated using an electric planimeter accurate to the nearest tenth of a square centimetre. It was originally our intention to conduct a formal ground survey over the entire Survey Region; owing to transport difficulties, however, we were only able to apply the sampling schemes described below to the area covered by the six southern aerial photographs (referred to hereafter as the Formal Survey Area, 575 square kilometres; see Map 5.1). Geomorphological research was completed in the entire Survey Region before the transport failed, but the only sites at the northern part which were properly recorded and tentatively dated were those on the left bank of the Souman-Bani (hereafter the Linear Survey Area).

Preliminary Test Survey. A primary test survey was first carried out within a five kilometre radius of Jenne. This was to assess the quality and detail of information available on the 1:50,000 aerial photographs. It became apparent that soil types as well as boundaries between major geomorphological features appeared very clearly, as might be expected in a region of such recent and forceful modelling by wind and water. In the floodplain and also at the edges of the more heavily wooded highlands it also proved very easy to locate accurately one's position on the aerial photograph (facilitating site location and establishment of transect limits). It also proved possible, from the aerial photographs, to identify floodplain and land normally above the flood level, as well as major soil types within those two major geographical divisions. Every site within five kilometres of Jenne was visited and several trends which characterized the results of the formal survey were immediately apparent: there were many more deserted sites than presently-occupied villages; there was a great variety in the size of sites; these sites tend to cluster together whereas modern villages are isolated from one another; and no lithic material was to be found at any site nor on the surface of the floodplain or highland features. In fact, the only material found on the floodplain itself were skeletons (often still articulated) of recently deceased domestic animals. (Animals which die in Jenne or in neighbouring villages are dragged to the surrounding floodplain where the force of the rising floodwaters sweeps away the remains left by carion-eaters.) The fact that the floodplain sites appeared as discrete mounds on the aerial photographs — the smallest and lowest as well as major tells — was an important discovery for the mapping of sites throughout the Survey Region. For that reason in particular we decided to apply probabilistic sampling schemes to the survey of the floodplain part of the Formal Survey Area, treating each visible site as a unit. By applying a sampling scheme design for coverage of the highland areas, we could assess whether or not sites on these landforms were equally or less visible than those on the floodplain.

Another major function of the primary test survey was to assess travel problems. Conditions of travel are important considerations for anyone

MAP 5·1

Divisions of the SURVEY REGION



rD (y) - red Dune (yellow)

planning survey, so these will be reviewed in detail here. The best season for extensive survey in the Inland Delta is late-February to mid-June, that is, after the floodplain has dried following the annual flood and before the rains become too heavy, at which point floodplain muds make travel impossible, either on foot or by motor car. Travelling by boat is easiest, of course, when the waters are high, but not every site in the Survey Region would remain above the level of the average flood, and travelling only along navigable water at low flood would give a highly biased view of the settlement pattern. The best time of year for survey is also the hottest and dryest. One must carry sufficient water for a full day of exertion. Floodplain soils are composed of hydrophillic clays and tend to crack and buckle upon drying. The buckling of some soils (e.g. Middle Plain-Loam) can be very considerable. Much of the floodplain is broken up by hoe or ploughed and cannot be driven over. Better roads tend to follow high ancient levees where, unfortunately, thorn trees and bushes thrive (Acacia seyal, Maerua senegalensis). Motor-cycles and bicycles proved equally unsatisfactory because of the thorns. Travel on horse or donkey is in some ways preferable (problems of carrying water and bags of pottery remain), but horses were scarce in 1977.

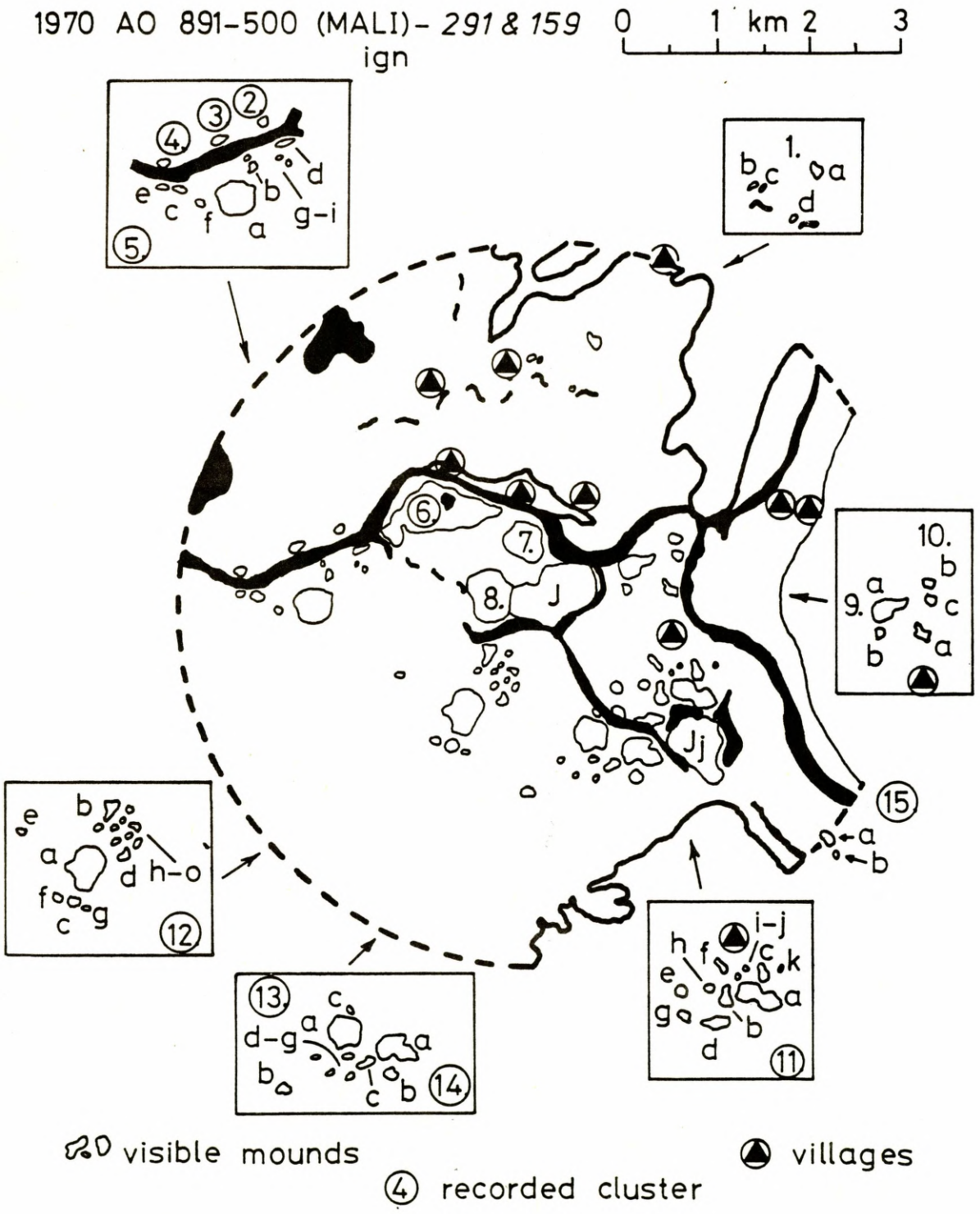
Formal Survey: Floodplain. The survey began by taking an area covered by a single aerial photograph as a separte and independent field of inquiry (12 aerial photographs in the Survey Region, 6 in the Formal Survey Area). Within each of these the inundated floodplain and the land permanently above water were searched by two different sampling schemes; the region was in this way stratified both geometrically and by natural features (cf. Redman 1974: 7) (see Maps 5.2 to 5.8).

Two considerations influenced the floodplain sampling strategy: 1) travelling the long distances between sites on the floodplain was slow and difficult, 2) once at a site, several hours were needed to record surface features and soil, and to search the immediate area for sites not visible on the aerial photograph (within 100 metres of each recorded site). Since sites tended to cluster together, sites on the same landform (generally, as it happened, on the same active or senescent watercourses) and within hailing distance of one another (approximately 0.5 kilometre radius, with exceptions e.g., 293-10-A-I) were grouped together into a 'cluster' or 'site-cluster'. These clusters rather than individual sites became the sample unit. In the 1977 survey 'clusters' contained as few as one and as many as sixteen sites.

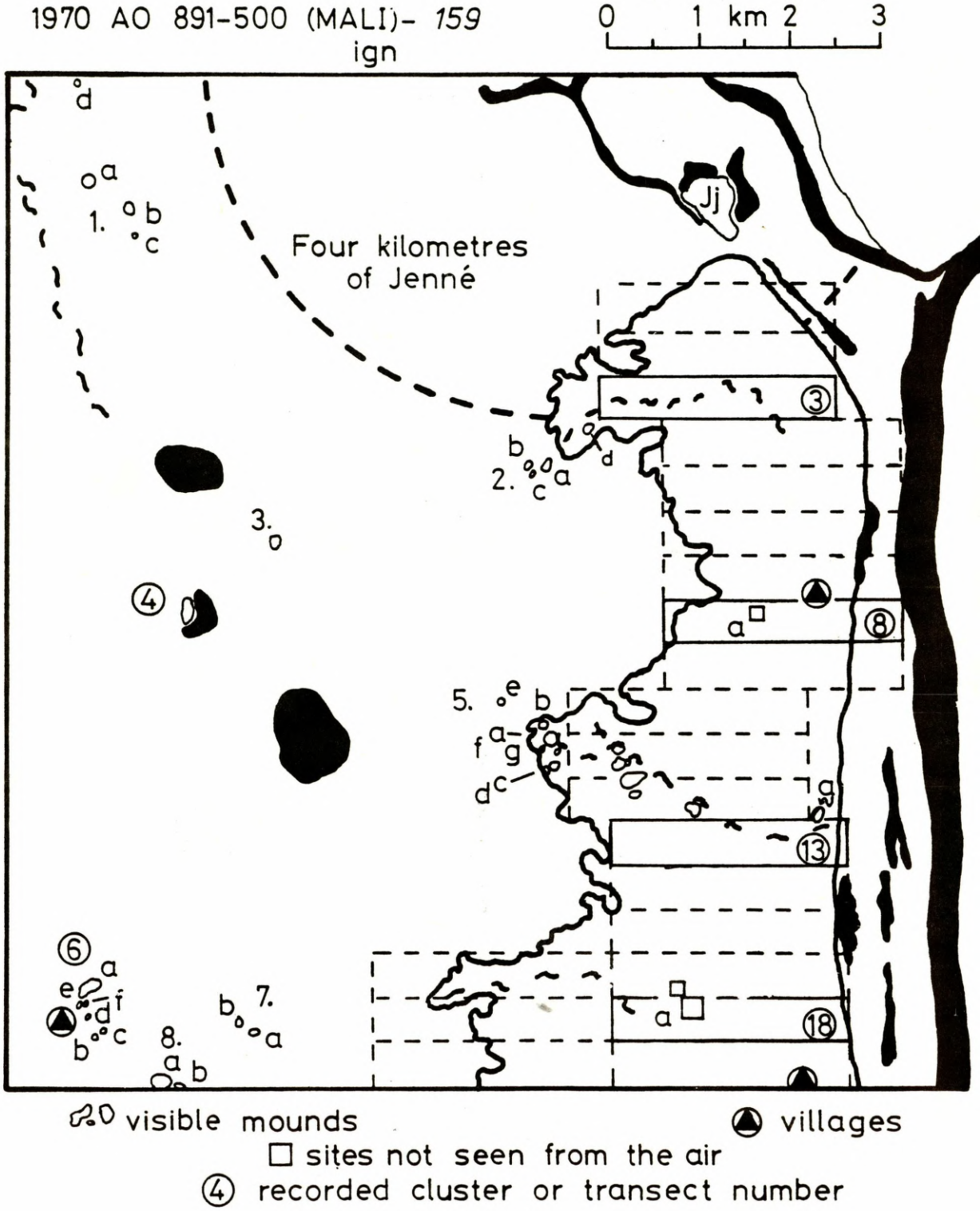
Using aerial photograph coverage, it was possible to identify 155 clusters and 370 individual sites in the floodplain part of the Survey Region. These clusters and sites were mapped and labelled as follows (see Appendix II): 1) all sites appearing in an aerial photograph took an initial identifying number from that photograph, e.g. (photograph 1970 AO 891-500) — 159 —; 2) all clusters were numbered in sequence by proceeding in a serpentine fashion from one cardinal point to another, e.g., 159-5-, 159-6-, ... (In future survey the numbering of clusters should be done in one cardinal direction only for all aerial photographs and strict adherence to latitudinal or longitudinal priority will be observed.); 3) all sites in each cluster then were given a letter designation, from the largest to the smallest, e.g., 159-6-A, 159-6-B, ... 159-6-F, for this cluster composed of six sites located within a half kilometre of each other.

MAP 5·2

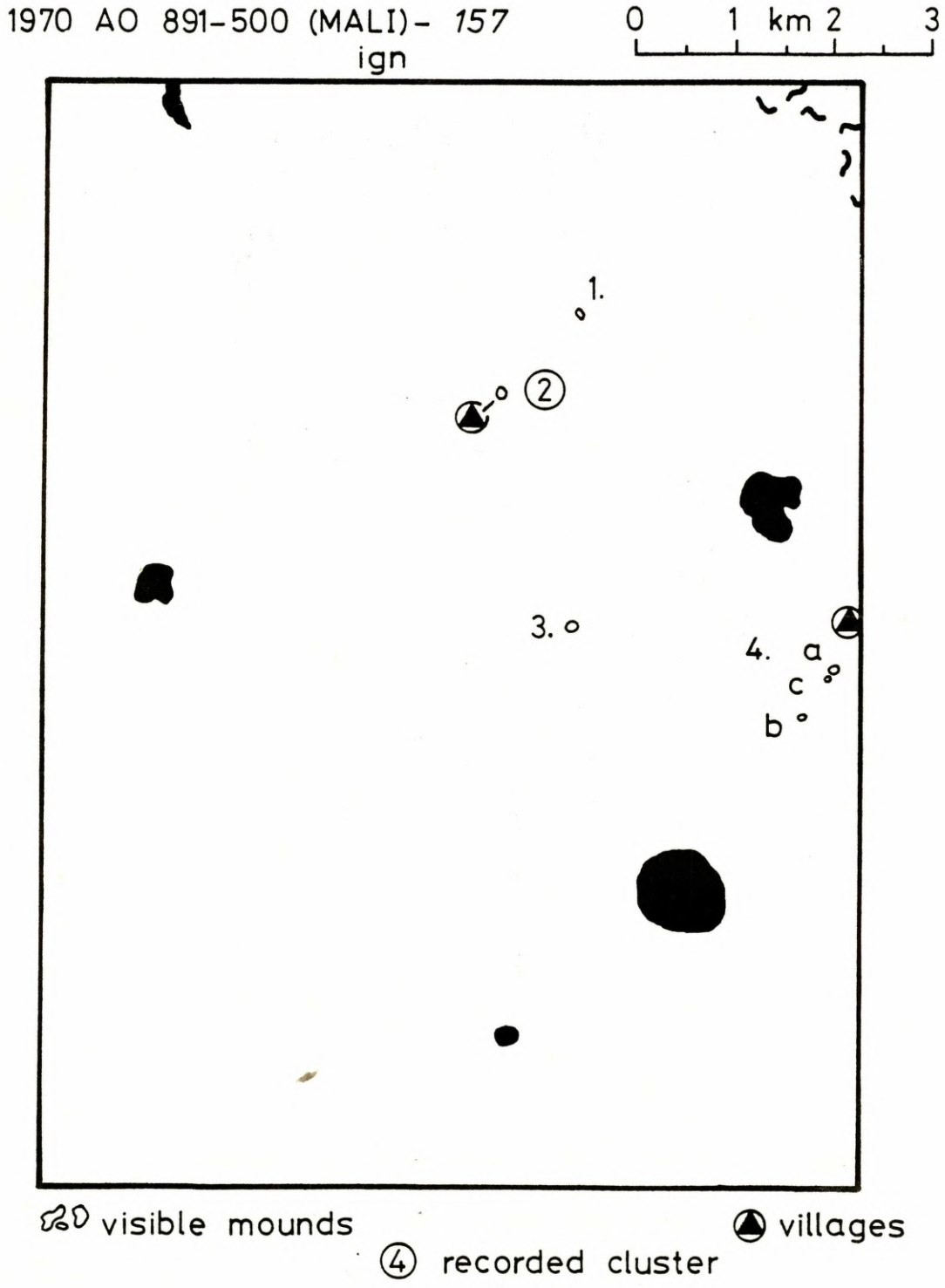
Within 4 kilometres of Jenne



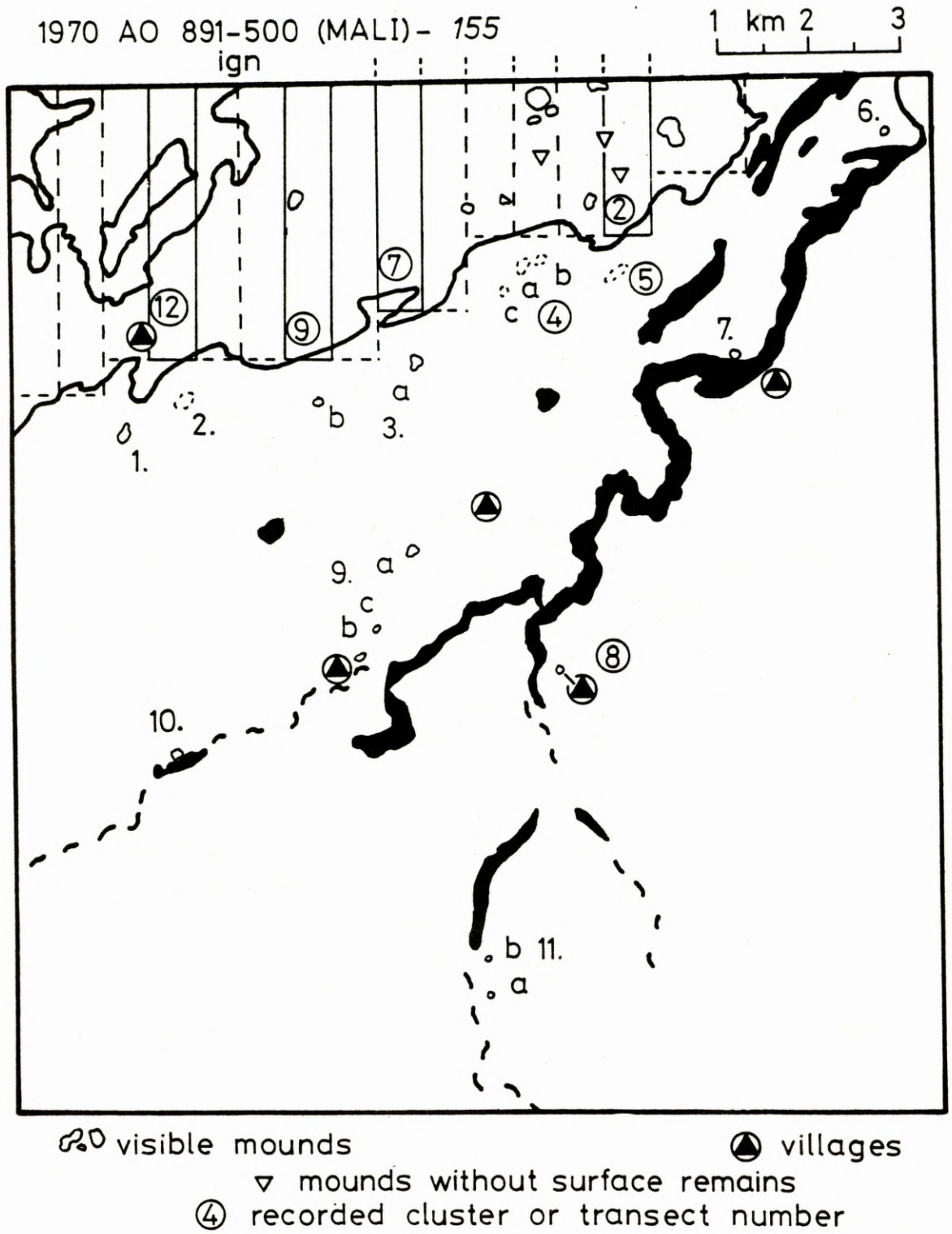
MAP 5·3


1970 AO 891-500 (MALI)- 159
ign
0 1 km 2 3
Four kilometres
of Jenné
Jj
visible mounds
villages
sites not seen from the air
recorded cluster or transect number

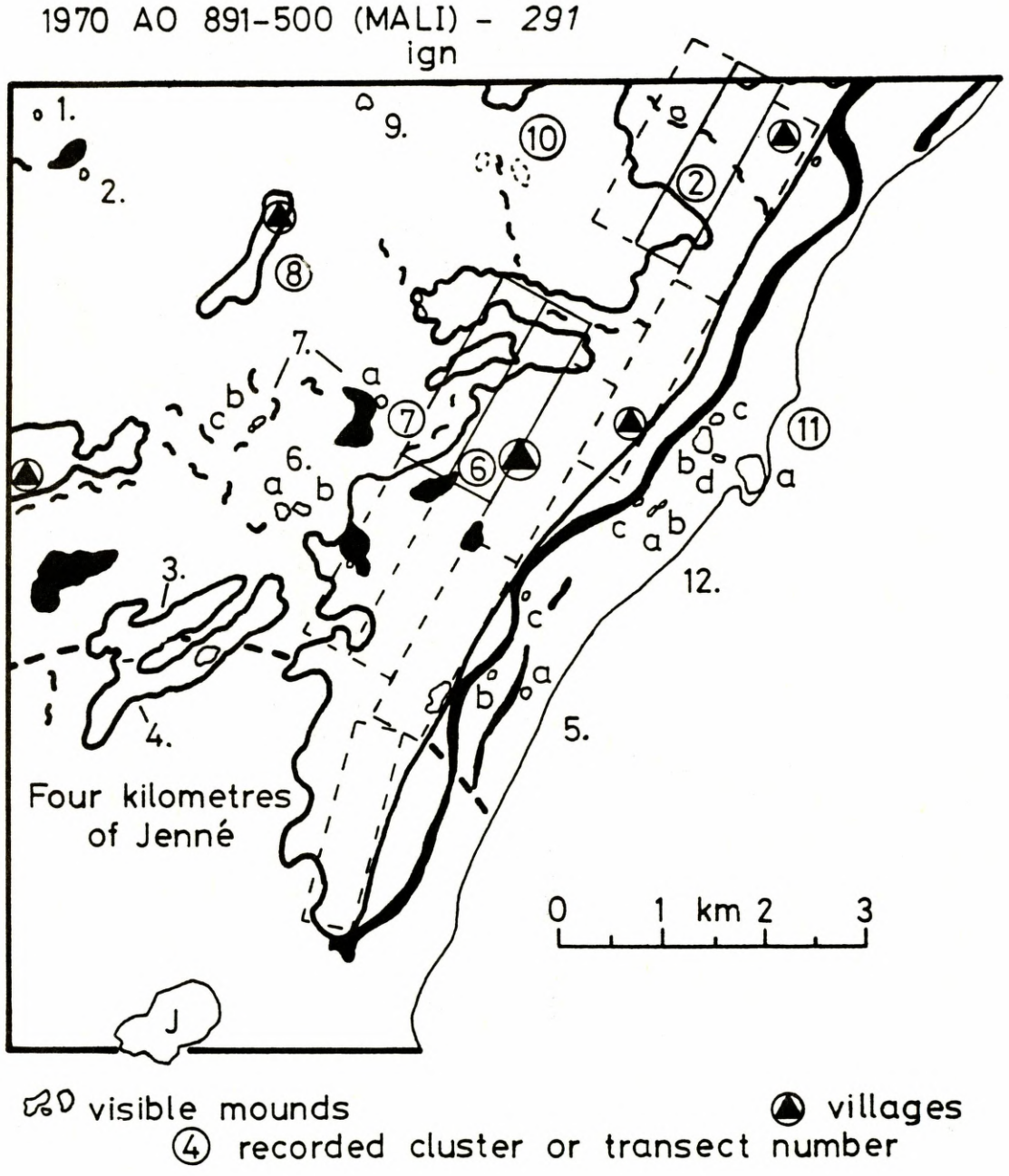
MAP 5·4


1970 AO 891-500 (MALI)- 157
ign
0 1 km 2 3
1.
2
3.
4.
a
c
b
visible mounds
villages
4 recorded cluster

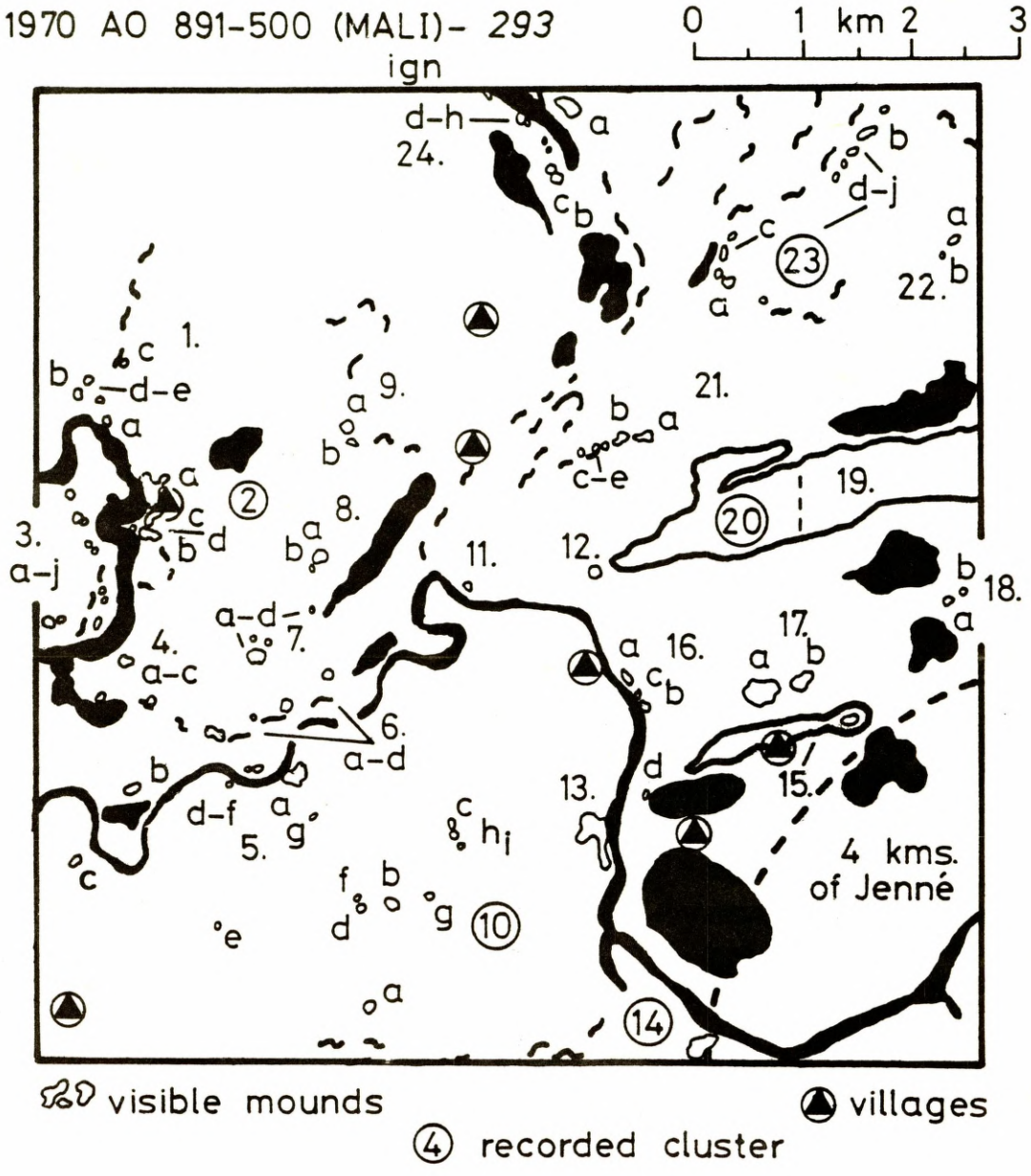
MAP 5·5


1970 AO 891-500 (MALI)- 155
ign
1 km 2 3
1.
2.
3.
6.
7.
9.
10.
11.
visible mounds
villages
mounds without surface remains
recorded cluster or transect number

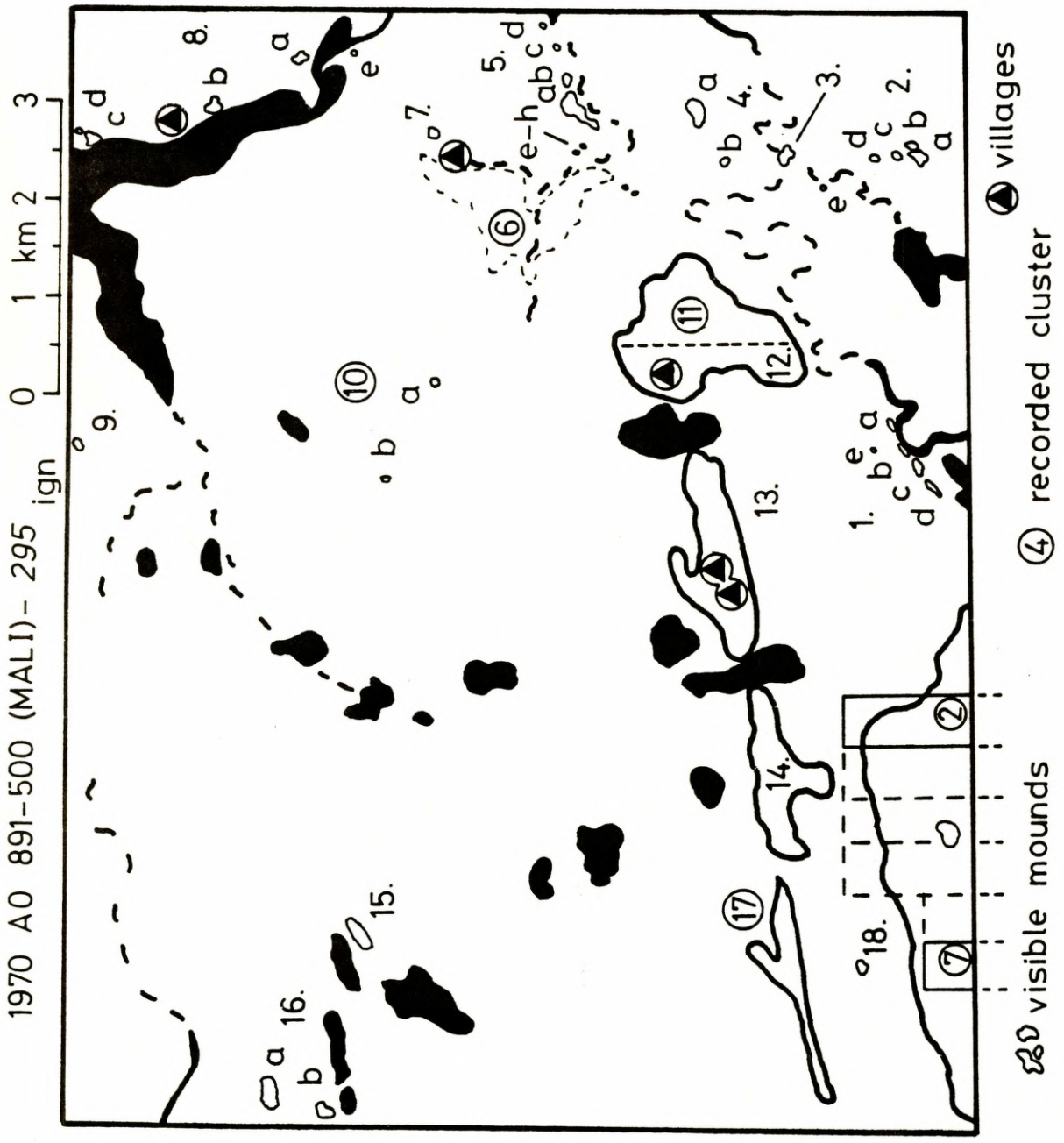
MAP 5·6


1970 AO 891-500 (MALI) - 291
ign
1.
2.
3.
4.
5.
6.
7.
8.
9.
10
11
12.
Four kilometres
of Jenné
0 1 km 2 3
J
visible mounds
villages
④ recorded cluster or transect number

MAP 5·7


1970 AO 891-500 (MALI)- 293
ign
0 1 km 2 3
d-h
24.
a
b
d-j
c
23
a
22.
b
a
cb
1.
c
b
d-e
a
9.
a
b
21.
b
a
c-e
19.
20
12.
2
a
c
b
d
8.
b
a
3.
a-j
11.
b
18.
a
a-d
7.
17.
4.
a-c
a
16.
a
b
c
b
6.
a-d
b
d
13.
15.
d-f
a
g
5.
c
hj
4 kms.
of Jenné
f
b
d
g
10
e
a
14
visible mounds
villages
④ recorded cluster

MAP 5·8


1970 AO 891-500 (MALI)- 295 ign
0 1 km 2 3
visible mounds
recorded cluster
villages

The next stage of the survey was to select a twenty percent sample of the site-clusters in each air photograph by drawing numbers from a table of random numbers, from a row or column of numbers selected from a different position in the table for each aerial photograph. There is no agreement in the literature about what size sample is most efficient for estimating the true nature of a 'population' of sites in a regional survey, but ten percent is an arbitrary figure often given and any increase in sample size over that would theoretically improve results. During 1977 all the sites in each selected cluster were visited, but only one or two (the most prominent) were formally recorded. Although a 'nested', or 'hierarchical' sample would have been preferable to a simple random sample of site-clusters followed by an arbitrary selection of constituent sites for formal recording, it was decided that the number of sites within clusters was too small to warrant further sampling while our recording standards remained so primitive (cf. Redman 1974: 19).

A more sophisticated type of sampling was conducted at several site-clusters within a four kilometre radius of Jenne; on the basis of these results it will be possible to formulate a better strategy for dealing with clustered sites during future seasons of survey. The individual sites within a cluster presumably represent differences in chronology (shifting settlement), ethnic composition (symbiosis of communities in close proximity), function, or perhaps none of these at all (sibling and contemporaneous communities or a single site divided by erosion after abandonment). We decided to postpone investigating those possibilities during the exploratory season, until we could learn from the analysis of artefacts from Jenne-jeno which materials to record in greatest detail for the chronological effect at least (although some attributes or artefacts are conceivably sensitive to time and to ethnicity).

Each cluster was visited in the order of their selection from the aerial photograph, and each aerial photograph was completed before beginning the next. While en route the floodplain was searched for other sites visible on the aerial photographs (recorded in Appendix II as a 'confirmed site' if there were any surface features or artefacts) and for lithic scatters. Upon arriving at the cluster, all mounds were visited and remains briefly noted and one or two of the largest mounds were arbitrarily selected for formal recording. Note was taken of topography and present-day land use nearby, soil tests were conducted, and at least one hundred metres around the cluster searched for cultural remains. Full information collected at sites within the Formal Survey Area during formal recording is found in Appendix III.

Formal Survey: Highlands. Limitations of time and resources also determined the sampling scheme used on highland areas. Highland areas were somewhat easier to reach from Jenne because better roads crossed them. Once there, however, the vehicles were always left at the road because of the danger of puncture by thorns. Thorns also made walking slow going, particularly on the heavy loam soils of high ancient levees. These are soils avoided by the Bambara farmers who prefer to clear only the better drained sandy soils for millet fields.

Each highland feature was divided into rectangular transects, one half kilometre wide and two to three kilometres long depending on the size of the feature (e.g. aerial photograph — 159 = 20 transects of 2.5 km by 0.5 km). These

were numbered sequentially. The survey then proceeded as a 'systematic sample': transects to be searched were separated from each other by an interval fixed by the percentage of the total (e.g., 20% of 20 = 4 transects, with 5 between each). The first transect was selected using a random number table (3) and the next three transects follow at the fixed interval (8, 13, 18) (cf. Redman 1974: 12-13). Researchers have often complained of difficulties finding and keeping to the boundaries of their survey unit in the field. In the Survey Region, it was a relatively easy matter if one began at the edge of the highland and the floodplain. Transects were usually oriented N-S or E-W and it was the responsibility of one member of the survey party to keep a course and to keep the others on course. Bearings were taken again at the far end of each sweep; on only two occasions was it necessary to rewalk a narrow band of the transect neglected during the search. On high levels three surveyors walking side by side covered the half-kilometre width by making three sweeps, one surveyor overlapping the previous sweep during the second and third transverse (i.e., 71 metres per person per sweep). On the open dunes three surveyors made two sweeps, with no overlapping (i.e., 83 metres per surveyor per transverse). Each transverse was walked slowly and was covered by taking a zig-zag course. Numbers of changes of direction during each sweep varied depending upon terrain and ground cover, but forty to fifty changes were made during each of the three sweeps of the 2.5-kilometre long transects. The soil was clear enough of vegetation even on the clay levees, permitting good visibility several metres to either side and, because most levee and dune surface is devoted to millet fields, peripheral visibility was also generally very good. It is likely that only minor scatters of pottery escaped notice, and these were in areas of somewhat heavier growth of thorn bushes (heavy loam near the floodplain) which were in each case given an extra search after the final sweep.

The smallest scatter of artefacts, or a single isolated feature (house foundation, urn) was recorded as a separate site. As it happened, the few minor scatters of artefacts encountered could all be associated with recent activities, for within fifty metres of any village is a zone of recently discarded pottery, rusted metal bowls, etc.. Modern pottery is immediately distinguishable from ancient forms and wares by its thick walls, coarse fabric and grog temper, poor preparation of the clay, and by red slip applied in linear designs. Occasionally, sherds of modern ware were also found on paths from villages to farms (when in Ghana, I observed that children in particular often dropped water jars and food vessels from their heads on the long walk to the farm). Ploughed or hoed fields were remarkably free even of small stones and we were told by several Bambara farmers on the red dune (aerial photograph-155; Map 5.5) that they deliberately removed pottery and other debris which might dull their agricultural tools. (This, I suspect, is why three mounds on the ancient dune, probably related to the presumed tumuli site and almost certainly artificial, had no remains on the surface; all were low enough to be ploughed and turned to millet fields.) During survey of the highlands several temporary huts of Fulani pastoralists were encountered; similarly, Bozo camps were noted when walking channels near the Bani at low water (aerial photograph-159; Map 5.3). Cultural remains at recently abandoned camps were never found, however. This is perhaps because these groups carry portable household items of organic material (e.g., light calabash bowls).

A final problem was the determination of the size of sites on the highland features. The problems involved in pacing sites are discussed in the later sections of this chapter, but it was difficult to determine if two adjacent sites are in fact the same settlement. All sites on the floodplain are discrete mounds and in all but one case, those on ancient levees were well isolated. In the case of site 159-T18-A (Map 5.3), there may in fact be two overlapping sites, but it was recorded as one site in two components until it can be revisited and a more exact estimation of the period of abandonment can be made. The greater difficulty arose during the survey of transect 2 of aerial photograph 155 (Map 5.5). One mound within the boundary of the transect was very probably part of a series of equal-sized mounds ringing (in semi-circle or circle) a prominent 'tumulus' visible perhaps four hundred metres to the west. Several reports of similar phenomena among the tumuli sites of the Goundam-Niafunke region are in the literature and it is reasonable to infer that all were associated. Therefore the central mound and three surrounding mounds were visited and pottery samples recorded from the surfaces of the presumed 'tumulus' and two of the peripheral mounds. All mounds, including a few very low mounds, appeared on aerial photographs of the red dune, but in the interior of the dune it was difficult to obtain compass bearings when a mound was located. Association of mounds in the field with those on the photograph was generally good, however.

Sites on highland soils are identified by the number of the appropriate aerial photograph, transect number (beginning with a 'T'), and an upper-case letter for each site within a transect (e.g., 159-T13-A).

Formal Survey: Immediate Vicinity of Jenne. Sites within a four-kilometre radius of Jenne were surveyed more intensively. All mounds and highland features (100% sample) within four kilometres of the Jenne mosque were visited and informal notes made at each site (see Map 5.2). Of the fifteen site-clusters, ten (or 67%) were formally recorded in the manner described above for sites in the floodplain. The clusters at which no formal recording was done were numbers 1, 7, 8, 9, and 10. In the immediate vicinity of Jenne we also conducted a preliminary test of the principle(s) of the clustering phenomenon. The reader will recall that during survey on the floodplain only the more prominent sites within each cluster were recorded. Therefore, we could not assess whether all sites within the same cluster were occupied simultaneously or whether, for example, the smaller sites were abandoned consistently earlier than the large sites. Clusters 5, 11, 12, and 14 near Jenne were selected (not at random) for this test. As in the floodplain, within each cluster the constituent sites were sequentially assigned a letter in order of site ('A' to the largest, etc.). Then a sample of at least 33% was selected by drawing numbers from a table of random numbers. For example, for cluster number 11, the numbers drawn were 1(site 'A'), 3(site 'C'), 4(site 'D'), and 8(site 'H'). These sites were then formally recorded, the bias towards prominent sites thus having been removed.

Informal Survey: Linear Reconnaissance. A small survey of the northern part of the Survey Region was also undertaken, along the motorable path from Jenne to Kouakourou, which parallels the Souman-Bani, at the extreme east of the Survey Region. Six sites along the road were formally recorded and

these are labelled by the number of the appropriate aerial photograph, 'Lin' (for Linear Survey), and the number two to seven going from south to north (e.g., 352-Lin-2; see Map 5.9). The first site is a small mound or fragment of sandy level near the village of Koina and which has ancient remains, but is currently used as the village cemetery. Although sites to be recorded were not selected by any random process, this linear survey may be useful to estimate the biasing effect of recording sites along navigable waterways alone.

Informal Survey: Rivercut Inspection. A final search not connected with the sampling pattern was undertaken in an attempt to find 'early' sites with lithic industries. None had been located in the alluvium beneath Jenne-jeno (excavated to 1.5 metres below the bottom of the earliest occupation level), nor on the surface of floodplain or highland features during survey. The Bani and its active distributaries (especially the Souman-Bani and the Marigot of Gomitago to the northwest of Jenne) have relatively recently incised channels into the floodplains. The following were searched (see Map 3.3): seven kilometres of rivercuts through the several parallel levees between the Bani and the Nyansannari; the length and both banks of the Marigot of Senouna from the Bani to Jenne (also known as the Hute); several left bank localities along the lower and middle Souman-Bani (particularly along the left bank of the Chalugol-Hute northeast of Jenne); most of the south bank of the Marigot of Gomitogo within four kilometres of Jenne (the Fokolore) and several localities on both levels of this distributary beyond four kilometres. In all approximately twenty kilometres were covered, where the rivers had exposed from three to four metres of levee or floodplain alluvium (often very recently). Where Iron Age sites were exposed by the river, the remains appeared very clearly in these vertical or subvertical sections; no Stone Age material was found (see Bertrand 1975: 137 for a doubtful report of tells built by "Neolithic" population in the Kounari northeast of the Survey Region).

Summary. The 1083 km^2 Survey Region was selected for investigation because it includes a representative cross section of Jenne-jeno's rural hinterland with a wide diversity of landforms and vegetation. Boundaries of the Survey Region were arbitrarily delineated to coincide with the boundaries of aerial photographs of the area, with the exception of the eastern boundary provided by the Bani and Souman-Bani Rivers. The objectives of the survey were threefold: first, to provide with minimum expenditure of time and money a base for quantitative and qualitative estimates of the character of archaeological sites in the Survey Region; second, to minimize existing archaeological bias which favours sites located on the banks of the Niger and Bani Rivers; and third, to provide 'ground truth' data which would facilitate detailed mapping from air photographs, with the goal of reconstructing the geomorphological and palaeoclimatic history of the Survey Region. For purposes of time and economy, the regional population of areas to be sampled was restricted to include only those elevated areas not subject to seasonal inundation. We made the assumption that the scanty traces of seasonal occupation which may exist on the floodplain have probably been obscured by alluviation or removed by currents in the floodwaters. This assumption may be incorrect, and it may discriminate against the seasonal or limited-activity sites of nomads, but the assumption proved correct at least in the case of an initial intensive

search of the floodplain within a five-kilometre radius of Jenne. The net effect of this assumption was to reduce by c. 90% the regional area to be surveyed.

The Survey Region was first stratified geometrically into 12 squares measuring c. 9.5 km by 9.5 km, which is the area covered by a single air photo. Geomorphological studies were completed within the entire Survey Region, but because of vehicle failure the settlement survey was confined to the area covered by the southern six aerial photographs, the Formal Survey Area. Within the Formal Survey Area, the two different classes of non-inundated areas were each sampled by a different, appropriate method: discrete mounds in the floodplain (located individually or in clusters) were identified on air photographs, numbers were assigned to each isolated site or cluster of several sites, and a 20% sample selected with the aid of a random number table for investigation; other upland areas (i.e., dunes and levees) were gridded into consecutively numbered transects and a systematic 20% sample was chosen for careful, on-foot investigation. The principal exception to the above procedures concerned the area within a 4-kilometre radius of Jenne, where all non-inundated areas were visited and formal recording completed at 67% of site clusters. Two other surveys were also undertaken: 1) to the north of the Formal Survey Area but still within the Survey Region, six sites along the west bank of the Souman-Bani were recorded in what we labelled the Linear Survey; and 2) approximately 20 kilometres of exposed rivercuts were searched within the Survey Region to look for remains of Stone Age occupation.

Formal Recording

An attempt was made to record in a uniform manner every site selected by the sampling techniques. Information from these sites falls into three categories: context, surface features, and preliminary pottery data. The first two categories were the responsibility of the writer; the recording of surface pottery from the sites was carried out under the present writer's supervision. The ceramics were studied in order to assign a tentative date to the final settlement of the site and the dating was aided by some surface features. All information recorded in the field is reproduced in Appendix III; an explanation of the descriptions and of the methods of recording used in that appendix follows here.

Context:

Aerial Photograph: Gives the number of the Institut Géographique National photograph on which the site appears. All photographs are of the series labelled (Mission) 1970 AO 891-500 (Mali) and the nominal scale of each is 1: 1:50,000.

Location: 1. Distance from Principal Point is the distance in millimetres on the aerial photograph from the Principal Point (centre of the camera lens and midpoint between the nick-points on the photograph) to the site. The direction from the Principal Point is given in degrees from north. 2. Geographical Co-ordinates records the location of the site by longitude and latitude to the nearest five seconds. 3. Distance from Nearest Village provides the name of the nearest currently-occupied settlement and the estimated distance in kilometres and direction from that village.

Topographic Situation: Includes a brief description of the geomorphological feature on which the site is located (and occasionally the position of the site on that landform) and modern agricultural or pastoral use of the land observed in 1977. Particular note was taken of sites located on the border of two or more different landforms.

Soils: This is a record of the nature of the soils of the geomorphological feature on which the site is located. A simple field test of soil texture as described by Ahn (1970: 19-20, Fig. 2.1) was applied to a single sample of soil taken from a location approximately twenty metres from each site (not from the site itself). This information was used to interpret the satellite imagery of the Survey Region and to draw Map 4.1. This test proved a useful tool in the field and was the only testing option available to us because of the prohibitive cost of flying suitably-sized soil samples to a full-equiped laboratory. But the test only identifies major components of the soil (sand, silt, and clay), and the effect of cementing agents such as soluble iron oxides is difficult to assess until a full series of granulometric tests can be arranged for comparable samples. The test classifies soils containing a high proportion of clay as a clay soil, a soil dominated by sand as a sand soil, and soils between these two as loam soils. Greater descriptive precision is geven by using the adjective 'light' or 'heavy', the former indicating more sand (or less clay) and vice versa (e.g., a 'light loam' is a mixture of sand, clay, and probably silt, in which particles of the sand end of the size spectrum moderately dominate those of the clay end).

Size: This is a record of two methods of estimating the surface area of the site. Both methods contain serious sources of error; these will be assessed in a later section of this chapter. In the field we paced a north-south line passing as close through the centre of the site as possible and then repeated the pace along an east-west line also passing through the centre of the site. The accuracy of the metre-pace declines with the presence of thorny vegetation. Several sites are ringed by a thick band of thorn growth making it impossible to find the edges of the site. These figures are used to calculate the area of the site by treating the surface of the mound as a plane-figure ellipse. The formula for the area of an ellipse, where $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, is πab (2a = major axis and 2b = minor axis). The size of the site can also be estimated directly from the aerial photograph. In this case the longest axis of the site, which need not be either the north-south or east-west line, is the major axis of the ellipse and the formula is again applied. The procedure and results are explained in detail below (p. 401). The height of each site is also given on the site record sheet, but this figure was very difficult to estimate in the field.

Tree Cover: Described as light, moderate, or heavy.

Thorn Cover: It is this more than any other factor which reduces the quality of observation at some sites. Some sites are edged by an impassible band of thorns, making the recording of features at their periphery very difficult.

Confidence in Coverage: There was no evidence of extensive digging or pot-hunting at any site formally recorded or visited but it is difficult to say which sites have been 'surface-collected'. Sites turned to fields are badly

disturbed and perhaps 30% of the surface of Jenne-jeno has no surface remains because farmers broke up house foundations and collected artefacts in the millet fields. Jenne-jeno was the only site away from the ancient dune with clear sign of cultivation, although others were devoted to mango groves. Three low mounds on the ancient dune have no surface remains or even a minor scatter of sherds or slag. It is possible, however, that these are sites (perhaps associated with the presumed 'tumuli'), which have been ploughed and surface collected for centuries. (This is a process which one can observe at the site of Begho in Ghana where hoed or ploughed fields erode badly during the heavy rains and farmers must remove stones, pottery, and other artefacts before planting the following year.)

The amount of thorn cover, pot-hunting and farming are together responsible for any variation in the quality of recording. This category is ranked on a scale of 'A' to 'C', with 'A' meaning that all parts of the site were searched for features and artefacts and 'C' generally meaning that thorns badly impeded the search at the periphery. The ranking applies as well to confidence in the accuracy of the pacing of the length and width. This is a very subjective category — other sites were nearly as large as Jenne-jeno and were too large to cover completely and thoroughly even during a visit of several hous (e.g., Kaniana, 291-E-6, was searched for twelve man-hours). It should also be noted that the observations are only valid for 1977 and observations made during another dry season are not strictly comparable. Erosion and wind deflation are active processes (although variable in annual effect) and every year some parts of house foundations, urn fragments, and smaller artefacts are carried away to be reinterred within the expanding periphery of the site, while others are exposed for the first time.

Surface features:

Surface features include non-portable features and all portable artefacts, excluding pot sherds. Each site was walked slowly, quadrant by quadrant, and the large features recorded. (In Appendix III, Section II, items, A-F, H, K-Q, EE, and GG). Observations of artefacts other than pottery were noted and tallied on the field record form. Artefacts were only rarely removed from their position, so that recording could be repeated in the future. Surface collection took place at Jenne-jeno because the site began to attract parties of small boys scouring the surface (which unfortunately had already been well-scoured by local 'antiquarians'). All surface finds were included with the consignment of artefacts deposited with the Ministry of Culture in Bamako.

Preliminary Ceramic Study:

When it became necessary to select pottery attributes to be recorded in the field we were faced with the difficult task of selecting those which might be sensitive to time without the benefit of prior knowledge of the local pottery tradition. So few pottery seriations had been carried out in West Africa that we could not rely on their aid (e.g., there is no general consensus in West Africa that, for example, roulette decoration tends to change more rapidly and consistently than rim shape). In an area of complex ethnic distribution and unknown commercial sources of pottery, other factors could be responsible for change in pottery attributes rather than time.

Since the formal analysis and seriation of the Jenne-jeno pottery had not yet been done, we could rely only on vague intuitions about which attribute might be the most time-sensitive. The persons recording pottery during survey were well-trained and experienced in the Jenne-jeno attribute categories. There was good uniformity of description, but some variety in the detail of description.

Recording was done in the field, without removing the pottery from the area. As this was a preliminary survey we wanted to disturb the surface of the site as little as possible. Field workers were assigned different quadrants and then themselves selected the specific collection locality. They were asked to collect all the pottery from an area of one square metre. As at Jenne-jeno, the pottery cover in a one square metre area was so thick that localities yielded on average eighty sherds for study (total of 6757). As at Jenne-jeno, each square metre group was sorted first to remove all but one sherd from each vessel. Two or three one-metre square localities hardly make a serious sample of a site with an area even of 1,000 square metres, so any conclusions based on the potsherds concerning the period of final occupation of the site have to be very tentative indeed.

The recorders first listed their position at the site and their impression of the density of the scatter of pottery in the vicinity (heavy, moderate, light, or negligible). They then collected together pottery from the one metre-square area and counted the sherds. They were asked to describe the predominating fabric (and to mention the presence of unusual characteristics such as sand tempering). They were asked to specify the colour of the fabric, and to give percentage figures for each colour to the nearest ten percent. They described the predominating type of twine (roulette) decoration and mentioned which other decorations were used. Occasionally, but not always, this information was given in the form of estimated percentages. They then described the type of slip (colour, presence of burnishing) as a percentage. They were asked to be very specific about painted pottery, to give the exact numbers, to describe the paint, and to sketch any decorative motifs which could not be described. They described the quality of preparation of the paste and firing as 'well-made', 'moderate', or 'poor'. They were then asked to describe any other pottery fabric or decoration, comment on their sample, and to list other artefacts collected amongst the sherds.

ANALYSIS OF THE SURVEY DATA

Habitation of Landforms: Past and Present

The surface area of the geomorphological features illustrated in Map 4.1 was measured from the aerial photographs by using an electronic planimeter accurate to the nearest tenth of a square centimetre (0.1 cm^2). Surface area is presented in Tables 5.1 and 5.2 to the nearest tenth of a square kilometre. The margin of error on either side should not be greater than $\pm$ 0.3 square-kilometre. Greater precision would be obtained by drawing a map of soil types and major landforms from survey in the field; the maps used here were drawn from the mosaic of aerial photographs. The major soil and landform

Table 5.6 Numbers of Settlements in the Formal Survey Area: Villages
(village counts from aerial photographs)

	Regional Divisions (see Map 5.1)					
	Pondori	Nyansannari	Jenneri	Derari	Dune	Totals
Individual villages	11	4	10	4	8	37
% of total villages	29.7	10.8	27	10.8	21.6	100
Landforms						
Clay Channel						
Individual villages	3	0	3	0		6
(row %)	(50)		(50)			(100)
column %	27.3		30			16.2
Sand Channel	2	0	0	2		4
	(50)			(50)		(100)
	18.2			50		10.8
Deep Clay	0	0	0	0		0
Middle Plain-Loam	1	0	0	0		1
	(100)					(100)
	9.1					2.7
Low Plain	2	0	3	0		5
	(40)		(60)			(100)
	18.2		30			13.5
Middle Plain-Sand	3	0	1	2		6
	(50)		(16.7)	(33.3)		(100)
	27.3		10	50		16.2
Light Levee	0	2	3	0		5
		(40)	(60)			(100)
		50	30			13.5
Heavy Levee	0	2	0	0		2
		(100)				(100)
		50				5.4
Sand				red	4	
					(50)	
					10.8	8
						(100)
				yellow	4	21.6
					(50)	
					10.8	

Table 5.7 Percentage of Grand Totals: Settlements in the Survey Region
Regional Divisions (see Map 5.1)

	Pondori	Nyansan-nari	Jenneri	Derari	Dune	Totals	Area %
% individual sites	32.4	7.0	31.4	24.9	4.4	(n=417)	
% site clusters	22.0	8.2	38.5	25.3	6.0	(n=183)	
% individual villages	22.9	8.3	31.3	16.7	20.8	(n=48)	
Division area (%)	28.0	3.1	20.4	44.9	3.6		
Landforms							
Clay Channel							
% individual sites	12.5	0	9.1	2.9		26.1	6.0
% site clusters	7.7	0	11.0	2.7		21.4	
% villages	6.3	0	6.3	0		12.5	
Sand Channel	7.7	0	15.6	6.0		29.3	8.0
	6.6	0	17.6	2.7		26.9	
	4.2	0	8.3	4.2		16.7	
Deep Clay	0	0	0	0		0	6.5
Middle Plain-Loam	2.6	0.2	0.2	2.0		5.0	21.0
	1.6	0.5	0.5	2.2		4.9	
	2.1	0	0	0		2.1	
Low Plain	1.2	0	5.0	2.2		8.4	21.0
	2.2	0	7.1	1.6		11.0	
	4.2	0	6.3	0		10.4	
Middle Plain-Sand	6.7	0	1.2	12.2		20.3	30.5
	3.8	0	1.6	15.9		21.4	
	6.3	0	2.1	12.5		20.8	
Light Levee	0	2.0	0.2	0		2.2	1.3
	0	3.3	0.5	0		3.8	
	0	4.2	8.3	0		12.5	
Heavy Levee	0	4.8	0	0		4.8	2.2
	0	4.9	0	0		4.9	
	0	4.2	0	0		4.2	
Sand				red	3.2		
					3.3		
					8.3	4.4	3.6
						6.0	
				yellow	1.2	20.8	
					2.7		
					12.5		

Table 5.8 Percentage of Grand Total: Settlements in the Formal Survey Area Regional Divisions (see Map 5.1)

	Pondori	Nyansan-nari	Jenneri	Derari	Dune	Totals	Area %
% individual sites	47.9	10.3	21.6	14.5	5.7	(n=282)	
% site clusters	41.2	15.5	22.7	11.3	9.3	(n=98)	
% individual villages	29.7	10.8	27.0	10.8	21.6	(n=37)	
Division area (%)	52.8	5.9	13.9	20.7	6.7		
Landforms							
Clay Channel							
% sites	20.9	0	7.4	2.8		31.2	7.7
% site clusters	14.4	0	7.2	1.0		22.7	
% villages	8.1	0	8.1	0		16.2	
Sand Channel	11.3	0	6.4	8.5		26.2	6.7
	12.4	0	2.1	4.1		18.6	
	5.4	0	0	5.4		10.8	
Deep Clay	0	0	0	0		0	12.3
Middle Plain-Loam	3.9	0.4	0	0		4.3	14.8
	3.1	1.0	0	0		4.1	
	2.7	0	0	0		2.7	
Low Plain	1.8	0	6.0	0		7.8	18.1
	4.1	0	10.3	0		14.4	
	5.4	0	8.1	0		13.5	
Middle Plain-Sand	9.9	0	1.8	3.2		14.9	27.3
	7.2	0	3.1	6.2		16.5	
	8.1	0	2.7	5.4		16.2	
Light Levee	0	2.8	0	0		2.8	2.3
	0	6.2	0	0		6.2	
	0	5.4	8.1	0		13.5	
Heavy Levee	0	7.1	0	0		7.1	4.0
	0	9.3	0	0		9.3	
	0	5.4	0	0		5.4	
Sand				red	4.6		6.7
					6.2		
					10.8	5.7	
						9.3	
				yellow	1.1	21.6	
					3.1		
					10.8		

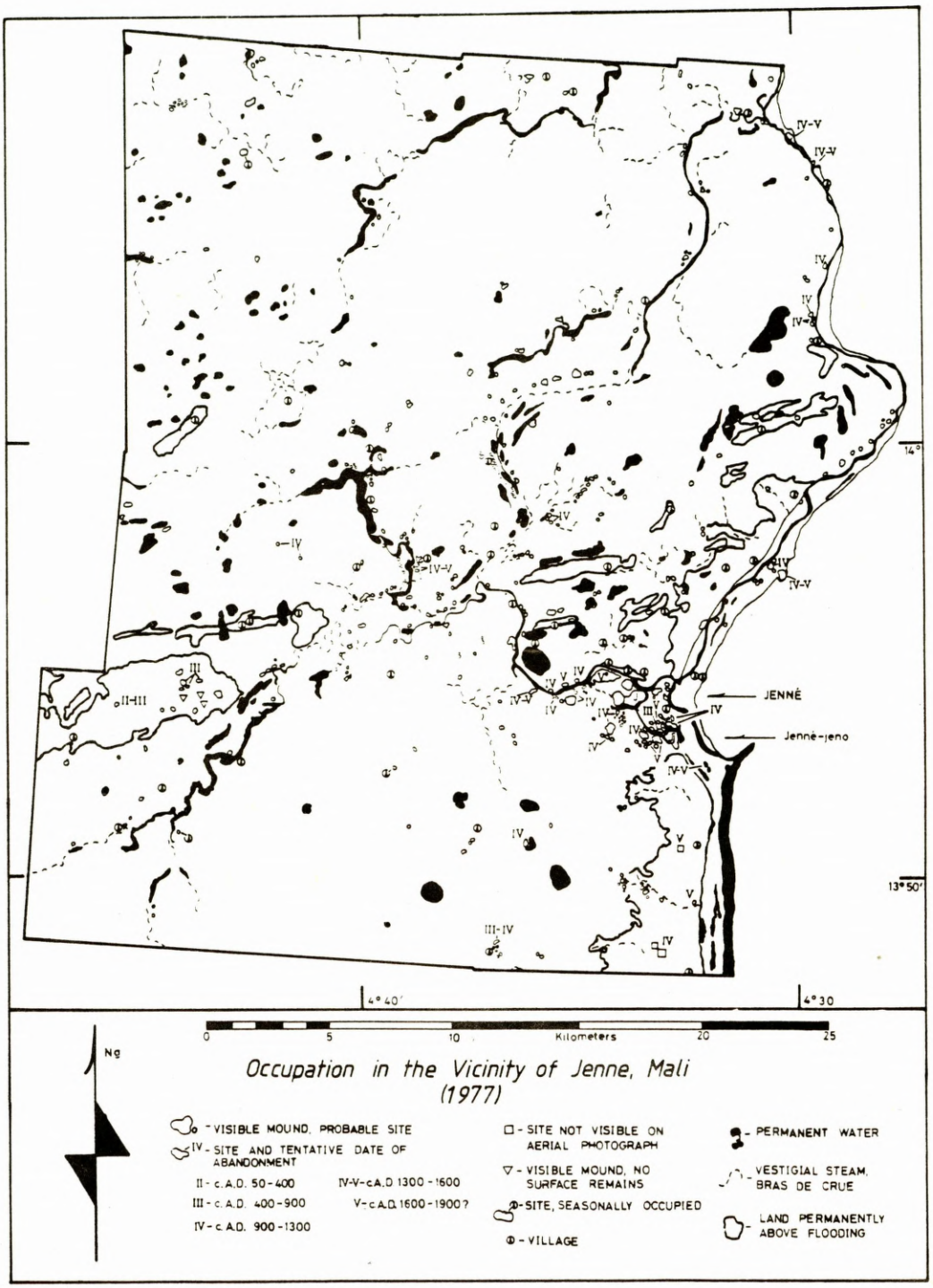
the red dune are included in the grand total, bringing the site totals from 404 visible sites to 417 grand total in the Survey Region (from 269 to 282 in the Formal Survey Area). Again, sites of all periods are grouped together (chronology is discussed in the next section of this chapter). Several major trends are seen even in these collapsed tables when one compares the distribution of modern villages with that of ancient sites (Survey Region): 1) abandonment of the Clay Channels (Clay Channel total of 26.1% of sites to 12.5% of villages), 2) similar abandonment of the Sand Channel (Sand Channel total of 29.3% of sites to 16.7% of villages), 3) reduction of occupation in the Middle Plain-Loam areas (total of 5.0% of sites to 2.1% of villages), 4) recent preference for the Light Levee soils, (Light Levee total of 2.2% of sites to 12.5% of villages). and 5) strong recent preference for the dunes (Dune total of 4.3% of sites to 20.8% of villages). There has never been any occupation of the Deep Clay regions, and occupation of the Medium Plain-Sand and Heavy Levee soils has remained much the same. The overall trend is towards abandonment of most of the deep floodplain (Clay Channel, Sand Channel, Medium Plain-Loam; combined yield from 60.4% of sites to 31.3% of villages) in favour of the light, well-drained, sandy highland regions (Dunes and Light Levee; combined yield from 6.5% of sites to 33.3% of villages). Altogether floodplain occupation has declined (from 88.7% of sites to 62.5% of villages), whilst that of the land permanently above flood has increased (11.3% of sites to 37.5% of villages). Overall, occupation of the Pondori and Derari has declined (37.4% of sites to 22.9% of villages, and 24.9% of sites to 16.7% of villages respectively) while that of the Nyansannari and Jenneri has increased and declined respectively only very slightly. That of the dunes has increased markedly.

These are very crude figures because sites of all Phases and of all types have been put together. Sites will be compared by period of abandonment (and nature) in following sections. All villages on the floodplain (but fewer on highland areas) rest on mounds clearly created over many centuries of occupation. In several cases Bozo fishermen move with the rising flood from dry season camps on the banks of the Bani to ancient mounds in the floodplain (where their houses remain empty for several months, e.g., 157-2 and 155-8). It is, of course, impossible to know how long these and other togguérés with present-day settlements (including Jenne) were occupied without conducting excavations. Several are nearly as high as Jenne-jeno, but it would be foolish even to try to estimate a general rate of accumulation from one site alone.

Chronology of the Settlements (Map 5.9)

It must be stressed once again that survey was not conducted during 1977 in such a way as to allow detailed extrapolations to be made from all parts of the Formal Survey Area to the larger Survey Region. Even had unforeseen transport problems not prevented us from sampling the entire Survey Region, this would have been true for floodplain regions which were not fully sampled according to statistical procedures. In future surveys all sites within site-clusters, or a sample of these sites selected by a random process will allow these extrapolations to be made. The dunes and the Nyansannari were surveyed in a sufficiently rigourous way in 1977 (a limited example of the type of extrapolations which may be attempted was presented above, viz., the estimation of the total numbers of sites not visible on aerial photographs).

MAP 5·9


JENNÉ
Jenné-jeno
14°
13°50'
4°40'
4°30
0
5
10
Kilometers
20
25
Ng
Occupation in the Vicinity of Jenne, Mali
(1977)
- VISIBLE MOUND, PROBABLE SITE
IV - SITE AND TENTATIVE DATE OF ABANDONMENT
II - c. A.D. 50 - 400
III - c. A.D. 400 - 900
IV - c. A.D. 900 - 1300
IV-V - c. A.D. 1300 - 1600
V - c. A.D. 1600 - 1900?
- SITE NOT VISIBLE ON AERIAL PHOTOGRAPH
- VISIBLE MOUND, NO SURFACE REMAINS
- SITE, SEASONALLY OCCUPIED
- VILLAGE
- PERMANENT WATER
- VESTIGIAL STEAM, BRAS DE CRUE
- LAND PERMANENTLY ABOVE FLOODING

Additionally, the methods used to date the period of abandonment of these sites are very crude. The assumption was made that sites in the vicinity of Jenne-jeno could be dated by referring to the ceramic sequence established at that site and it was assumed that the distribution of attributes within artefact assemblages at these sites were influenced primarily by chronological factors, to the exclusion of ethnic or personal effects. Sherds were selected from a very few small localities on the surface of sites and the recording of attributes was hardly complete. Nevertheless, the major Phases to which these sites are assigned are probably correct and sufficient for present purposes.

The period of abandonment is recorded either as a single period (e.g., Phase IV) or as jointly (e.g., Phase III-IV). The former means that the surface pottery from the site strongly share attributes characterising the pottery assemblage of that particular Phase at Jenne-jeno. A joint designation like Phase III-IV means that the pottery has some characteristics which are present in late Phase III and which continue at least into early Phase IV at Jenne-jeno. Sites abandoned after Phase IV (i.e., some time after c. 1300-1400) are difficult to date due to the termination of the Jenne-jeno sequence at that point, although sites were assigned to Phase V (c. 1600-1900) on the basis of tobacco pipes and closeness of the pottery to modern pottery at Jenne. One sees whole tobacco pipes only in the stalls of 'antiquarians', and we can only hope that fragments of pipes are neglected during surface collection by the local people.

As at Jenne-jeno, the sample recorded was so tiny that it was inappropriate to apply a probabilistic sampling scheme to determine where the pottery localities shoud be. (Redman suggests that this be done even in the exploratory first stage of his 'multi-stage field research project', but he of course assumes that a far larger percentage of the area of each site could be recorded (i.e., on the order of 10-20% minimum) (Redman 1974: 28; Redman and Watson 1970: 281-282.)

Seven attributes of the sixteen attributes analyzed in the Jenne-jeno assemblage proved to be the most time-sensitive. Two of these, sand-tempered paste and clear orange paste, were strongly characteristic of Phase I deposits and had almost completely disappeared by the beginning of Phase III. Another attribute, twine decoration number 7, is strongest also in Phase I, but disappears by the end of Phase II. These three elements were searched for during survey and would have been recorded had Phase I or Phase II sites been found. Observers would also have noted the well-made and thin-walled ware of Phase I had it been present. We can therefore be relatively certain that sites abandoned during this period were not overlooked.

The two attributes most characteristic of Phase III deposits were paint decoration (which peaks markedly during Phase III) and a significant frequency of carinated vessels (which increase to 25% of rim-vessel shape during Phase III, but sharply decline during Phase IV). Only the first of these classes was recorded in the field. Phase III deposits are also characterized by the clear predominance of Twine 4 (c. 40%) over combined Twines 1 and 2 (although Twine 4 has slightly declined since Phases I and II). Coarse paste rises no greater than c. 20% by the end of Phase III and it is well over 25% throughout Phase IV.

The major indicators of Phase IV deposits were T-rimmed bowls and the predominance of Twines 1 and 2. Poorly-made pottery increases in the assemblage appreciably during Phase IV. Therefore, the major elements used during survey to distinguish pottery similar to Phase III pottery at Jenne-jeno from that similar to Phase IV pottery is the presence of paint, predominance of Twine 4 and better preparation for the former and, for the latter, a clear predominance of Twines 1 and 2 and a relative increase in coarse, ill-fired fabric. Of course it would have been preferable to have had precise percentages for the frequency of each class of twine decoration, as well as percentages of inner and outer slipping (the former increases in popularity during Phase II), presence of slip on the rim, presence of carinated pottery, and all rim types.

However, even in its crude form the pottery data provides a good indication of the period of abandonment of these sites, measured as 'Phases' similar to those recognised at Jenne-jeno and dated by radiocarbon dates.

The data from the survey do fall into patterns which may represent true chronological trends, and which, once isolated, may be systematically investigated when next in the field. It will be relatively easy to design a method to adequately test these suggested trends, armed with some knowledge of the nature of sites and terrain of the floodplain, and of the ceramic and artefact attributes most likely to yield chronological divisions smaller than the Phases of several-hundred-years length used here.

Sufficient data were recorded to suggest the time of abandonment of the forty-one sites recorded in the course of the Formal, 20% systematic sample survey plus Jenne-jeno (see Map 5.9). These sites are listed by Phase in Table 5.9 and by the landform on which they are found in Table 5.10. It is interesting to note how closely the percentages of dated sites do or do not compare to the percentage of estimated total of sites by geographical region: Pondori, 43% of dated sites to 31.1% of the estimated grand total (46.4% of the estimated grand total for the Formal Survey Area); Nyansannari, 7% of dated sites to 7.1% of estimated (10.6% in Formal Survey Area); Jenneri, 31% of dated sites to 20.4% of estimated (22.3% in Formal Survey Area); Derari, 10% of dated sites to 25.4% of estimated (15.0% in Formal Survey Area); and Dune, 10% of dated sites to 4.4% of estimated (45.8% in Formal Survey Area). Nothing more should be made of these observations than to register a warning of possible slight over-representation of trends in the Pondori, Jenneri and Dunes, and an under-estimation of these in the Derari. Again, the estimated grand totals of sites for each of these geographical regions were obtained by possibly biased sampling and by proceeding from untested (but probably sound) assumptions.

In order to correct these sources of bias, at least in a limited way, an experiment was made to expand the probability sampling scheme to the entire Formal Survey Area by selecting by use of a random number table a 20% sample of the fifteen site-clusters within four kilometres of Jenne. The clusters so chosen (4, 14, and 11) are added to those of the survey of the rest of the Formal Survey Area and the results are illustrated in Table 5.11. Again, these results cannot be used for statistical study because sites within clusters were not selected for formal recording by random process. In the Expanded Formal (Probability) Survey the Pondori yielded 36% of the total of

Table 5.9 Period of Abandonment 9(correlated with Phases defined at Jenne-jeno)

II	III	IV	IV-V	V	
Formal Survey					
	155-T2-A(Main)		293-2-B		
	155-T2-A(EO)		293-2-D		
	155-T2-A(SE)		293-14		
					TOTAL
155-T9-A		295-10-A	291-11-A		III=22%
		295-10-B		159-T8-A	IV=44%
		293-23-A		159-T13-A	IV&IV-V=67%
		293-23-C			V=11%
		291-11-B			
		159-4			
		159-6-A			
		159-T18-A			
Within four kilometres of Jenne					
	159-E-11D			291-E-3	
		291-E-2		291-E-6	
		291-E-4		159-E-11H	
		291-E-5A		159-E-14A	TOTAL
		291-E-5B		159-E-14C	III=6%
		291-E-5C			IV=61%
		159-E-11A			IV&IV-V=67%
		159-E-11C			V=28%
		159-E-12B			
		159-E-12C			
		159-E-13A			
			159-E-15A		
		Jenne-jeno			
Linear Survey					
	352-Lin-2				
	352-Lin-3				TOTAL
	352-Lin-4				IV=67%
	379-Lin-5				IV&IV-V=100%
			379-Lin-6		
			379-Lin-7		
	5	23	7	7	

Table 5.10 Dates of Sites on Different Landforms

Clay Ch.	Sand Ch.	MP-L.	Low Plain	MP-S	Lt Levee	H Levee	red D.
Formal Survey							
291-11-A:IV-V		159-6-A:(III)-IV			159-T8-A:V		155-T2-A(Main):III
291-11-B:IV			159-4:IV		159-T18-A:IV		155-T2-A(EO):III
	293-2-B:IV-V			295-10-A:IV			155-T2-A(SE):III
	293-2-D:IV-V			295-10-B:IV			155-T9-A:II-III
	293-23-A:IV			293-14:IV-V			
	293-23-C:IV					159-T13-A:V	
Within four kilometres of Jenne							
291-E-5-A:IV			291-E-2:IV				
291-E-5-B:IV			291-E-3:V				
291-E-5-C:IV			291-E-4:IV				
291-E-6:V							
159-E-11-A:IV-(V)				159-E-13-A:IV			
159-E-11-C:IV				159-E-14-A:V			
159-E-11-D:III				159-E-14-C:V			
159-E-11-H:V							
159-E-12-B:IV							
159-E-12-C:IV							
159-E-15-A:IV-V							
Jenne-jeno-late IV							
Linear Survey							
352-Lin-2:(III)-IV		Total 42	Pondori	n=18; 43%			
352-Lin-3:IV			Nyansannari	n= 3; 7%			
352-Lin-4:IV			Jenneri	n=13; 31%			
379-Lin-5:IV			Derari	n= 4; 10%			
379-Lin-6:IV-V			red Dune	n= 4; 10%			
379-Lin-7:IV-V							

Table 5.11 Dated Sites: Expanded Formal (Probability) Survey

Clay Ch.	Sand Ch.	MP-L.	Low Plain	MP-S.	Lt. Levee	H. Levee	red D.
Formal Survey							
291-11-A:IV-V		159-6-A:(III)-IV			159-T8-A:V		155-T2-A(Main):III
291-11-B:IV			159-4:IV		159-T18-A:IV		155-T2-A(EO):III
	293-2-B:IV-V			295-10-A:IV			155-T2-A(SE):III
	293-2-D:IV-V			295-10-B:IV			155-T9-A:II-III
	293-23-A:IV			293-14:IV-V			
	293-23-C:IV					159-T13-A:V	
Within four kilometres of Jenne							
159-E-11A:IV-(V)							
159-E-11C:IV							
159-E-11D:III							
159-E-11H:V							

Total 25	Pondori	n=9; 36%
	Nyansannari	n=3; 12%
	Jenneri	n=5; 20%
	Derari	n=4; 16%
	red Dune	n=4; 16%

25 dated sites (31.1% of estimated sites in the Formal Survey Area), the Nyansannari 12% (7.1% of estimated sites), the Jenneri 20% (32.0% of estimated sites), the Derari 16% (25.4% of estimates sites) and the Dunes 16% (4.4% of estimated sites). Neither the combined numbers of dated sites nor the Expanded Formal (Probability) Survey necessarily reflect the true situation any better, but it is interesting that analysis of both yields the identical gross patterns. These patterns are presented here by chronological Phase; they are the trends to be more rigorously substantiated during future surveys.

Phase III (c. A. D. 450-900): The fact most immediately seen in Table 5.12 is that four of the five sites whose abandonment can be dated to Phase III are found on the ancient red Dune. These are the only sites found on the red Dune. The fifth is a small site between Jenne and Jenne-jeno (159-E-11-D). Three of the four dated mounds on the red Dune are, in fact, the only sites which do not share a remarkably similar appearance in shape, surface features, and surface scatter of sherds and slag with Jenne-jeno. These three mounds, 155-T2-A (Main, Southeastern and Eastern Outliers) are clearly related to one another and there is little doubt in the authors' minds that the first is a mound similar to the earthen tumuli found in abundance in the Goundam-Niafunke region (cf. Desplagnes 1903 and 1951) and also as far away as Senegal (e.g., Rao, which was also located on a red, 'Ogolian' dune) (cf., Joire 1955). The other two appear to be part of a semi-circle of smaller mounds around 155-T2-A (Main). In the Goundam-Niafunke region there are similar semi-circles of smaller peripheral mounds, usually with the centre of the semi-circle towards the north; on the red dune, the centre of the semi-circle is towards the east. The principal site is approximately 150 metres in diameter, 7-10 metres high and conical in shape. The top is not flattened in the manner of settlement sites, and its surface is relatively clear of remains. Several other presumed tumuli appear on the aerial photograph, including a very large mound to the east of this group (155-T1). If established to be tumuli by excavation, these will be the southern-most extension of this burial custom yet reported in Mali.

The fourth site on the red dune, 155-T9-A, is a very low mound with a moderate amount of surface remains, but badly disturbed by ploughing. This may represent a settlement occupied at approximately the same time as the erection of the 'tumulus' group. It is interesting to note that the pottery collected at these early sites is immediately recognizable as very similar to Phase III pottery at Jenne-jeno. Although Phase III was the period of increasing use of large funerary urns for burials at Jenne-jeno and no funerary urns were found at any site on the red dune, the presumed difference in burial practices may be one of variation within the same cultural tradition. Whether it is a matter of one group burying their dead in three ways (simple inhumation, urn burial, and tumulus burial) or of more than one group obtaining their pottery and other material goods from a common source cannot be known at the present.

Because the numbers of sites abandoned in Phase III are so low it is not possible to say more about preferences of soil types or landform categories. Three mounds are visible on aerial photographs of the recent dunes and two

TABLE 5·12

Dated Sites

(n=42) *Percentage of Total*

		Clay Channel	Sand Channel	Deep Clay	Middle Plain Loam	Low Plain	Middle Plain Sand	Light Levee	Heavy Levee		Regional Totals	
Pondori (18) *43%*	III IV IV-V V	(1) *2* (8) *19* (1) *2* (2) *5*			(1) *2*	(1) *2*	(1) *2* (1) *2* (2) *5*			III IV IV-V V	(1) *2* (11) *26* (2) *5* (4) *10*	(13) *31%*
Nyansannari (3) *7%*	III IV IV-V V							(1) *2* (1) *2*	(1) *2*	III IV IV-V V	- - (1) *2* - - (2) *5*	(1) *2%*
Jennéri (13) *31%*	III IV IV-V V	(5) *12* (3) *7*	(2) *5*			(2) *5* (1) *2*				III IV IV-V V	- - (9) *21* (3) *7* (1) *2*	(12) *29%*
Dérari (4) *10%*	III IV IV-V V		(2) *5*				(2) *5*			III IV IV-V V	- - (2) *5* (2) *5* - -	(4) *10%*
Red Dune (4) *10%*										III IV IV-V V	(4) *10* - - - - - -	- -
Yellow Dune - -										III IV IV-V V	- - - - - - - -	- -
Landform Totals	III IV IV-V V	(1) *2* (13) *31* (4) *10* (2) *5*	- - (2) *5* (2) *5* - -		- - (1) *2* - - - -	- - (3) *7* - - (1) *2*	- - (3) *7* (1) *2* (2) *5*	- - (1) *2* - - (1) *2*	- - - - - - (1) *2*	III IV IV-V V	(5) *12* (23) *55* (7) *17* (7) *17*	(30) *72%*

of those are quite large (291-4 and 293-15). These three mounds were not included in the 20% survey of yellow dunes, so one will have to wait for future survey to determine whether or not the preference of 'tumuli' builders for red Dune soils extended as well to yellow Dune soils. This would seem reasonable because the soil of either type of dune are more easily worked than even the light soils of the Light Levee and much more so than the heavy loam or clay soils of the floodplain. Although erection of these special 'tumulus groups' appears to be limited to high dune soils, other Phase III activity was clearly not so limited. Site 158-E-11-D and Jenne-jeno were occupied during that Phase and there is no doubt in the authors' minds that many other sites in the Survey Region were also. Lastly, contemporary villages on the dunes are built immediately upon the dune soils or rest on mounds appreciably less elevated than those of other villages in the Survey Region. This relatively thin accumulation of deposits may suggest that these villages were first occupied comparatively recently. Was the red Dune (or both dunes), the scene of activity during the latter half of the first millennium A. D. and then deserted until recently (until the Bambara migrations of the sixteenth century?) or has evidence of settlement during the intervening period been erased by agricultural activity?

Phase IV (c. A. D. 900-1300): It must be stressed again that the date assigned to these sites is that of their final occupation and abandonment only. At the risk of giving an impression of artificial precision, the sites are divided into those abandoned during Phase IV (up to approximately the time of the end of Jenne-jeno) and those which may have been occupied a century or two longer (to the late sixteenth century, Phase IV-V). Doubt about the actual date of abandonment of Jenne-jeno makes this division necessary.

Twenty-three of the forty-two Formal Survey sites (or 55%) were abandoned during Phase IV (11 of the 25 sites in the Expanded Formal Survey). Eleven of the 18 sites on the Pondori (or 61%) and 9 of the 13 sites on the Jenneri (or 69%) were abandoned during this phase, whereas only two of the four sites on the Derari (50%) and one of the three sites (or 33%) on the Nyansannari were abandoned then. These same trends appear in the Expanded Formal Survey. The Pondari and Jenneri are the lowest regions and boast the heaviest soils. The heavier soil types (with the exception of Heavy Levee) also have the highest number of sites abandoned during this phase, viz., Clay Channel 13 of 20 (65%); Middle Phase-Loam, one of one; and Low Plain, three of four (75%).

Most of the sites within four kilometres of Jenne (including Jenne-jeno) were abandoned during this period (61%). If one can trust the relative positions within the Phase listed in Table 5.9, then most of these Phase IV sites within 4 kilometres of Jenne were abandoned in the latter half of the Phase.

Phase IV and IV-V (c. 900-1600?): Thirty of the forty-two sites (72%) were abandoned during this combined Phase (15 of the 25 sites, or 60% in the Expanded Formal Survey). In the Pondari 13 of the 18 sites (72%) are of this Phase, 12 of the 13 sites on the Jenneri (92%) are of this Phase, as are all the sites on the Derari. The apparent trend is that low, clay parts of the floodplain lost settlements initially, and shortly thereafter sites on the lighter, sand soils of the floodplain were abandoned. During Phase IV and IV-V, 17 of 20 sites on the Clay Channel (85%) were abandoned, all four sites on the

Table 5.14 Occupation of Waterway Channels

		Total area of adjacent clay or sand channel (km^2)	Sites (villages)		
			Numbers	Mean size	Number/km^2
1.	Bani River	6.6	0(0) ha.	0(0)	0(0)
2.	Hute	8.2	37(5)	1.38(0.54)	4.6(0.6)
3.	Souman-Bani	27.3	33(5)	1.5(1.45)	1.2(0.2)
4a.	Marigot of Gomitogo	15.4	43(1)	0.83(1.64)	2.8(0.06)
4b.	upper Marigot of Gomitogo	2.1	19(1)	0.92(1.64)	9.0(0.4)
5.	Soalobo	18.5	5(3)	0.57(4.64)	0.2(0.16)
6.	Mayo Manga	31.7	48(3)	0.98(1.21)	1.6(0.1)
7.	Konguene-Finakie	19.0	36(3)	0.39(1.99)	1.8(0.16)
	Total Waterways	128.8	202(20)	0.93(1.7)	1.6(0.16)
	Survey Region	1083.3	404(48)	0.95(1.98)	0.38(0.04)

occupation which is average in size and density. These data are clearly too crude to allow a resolution of the problem of identification of waterways used as principal routes.

Site Clustering. The problem encountered when attempting to develop a universally applicable definition of a cluster of sites was explained above. In most cases clusters are groups of sites generally within 0.5 kilometre of one another. However, by the simple application of this criterion there would be several very long chains of sites (e.g., one on the Mayo Manga at approximately 14° North latitude, which would be longer than ten kilometres). These continuous chains were divided according to the observation that generally there are one or more sites at some distance greater than 0.5 kilometre from one another, with smaller sites around each. The larger sites were arbitrarily chosen as the centres of the clusters.

The data on site clustering are presented in a refined state in Tables 5.15 and 5.16. Clusters are divided into six categories representing an arithmetic progression of the numbers of sites contained in each cluster: (1); (1 + 1 = 2); (2 + 2 = 4, i.e., 3 and 4); (4 + 3 = 7, i.e., 5, 6, and 7); (7 + 4 = 11); and (11 + 5 = 16). The number of clusters in each of these six divisions is then presented by geographical division and by soil/landform category. Of the 406 sites in the Survey Region, 96 (or 23%) are isolated or single sites, 62 (15%) are paired sites, and the remaining 62% occur in 47 larger clusters of three or more sites each. Three of these clusters contain as many as 12-16 sites. This compares to the distribution of contemporary settlements (n = 48) in which 42 (or 87%) are isolated and only six (13%) are paired villages (i.e., there are three cases where modern villages are composed of two adjacent settlements).

Two sets of observations provide a basis for comparison. The number of sites found within clusters, expressed as a percentage of all sites within that category (and given below in the form 'x% clustered'), show to what extent inhabitants preferred to live in isolated settlements or in settlements with other mounds nearby. Secondly, the number of clusters composed of five or more sites, expressed as a percentage of all clusters for a given geographical division or landform category, provides a crude estimate of the strength of the tendency towards multi-site clustering within that category. This second observation is expressed below in the form 'x% elaborated clusters'.

There is considerable uniformity in these expressions of clustering between geographical categories. This suggests that, in general, the same principles governed the tendency to cluster. The exceptions are a slightly higher tendency to cluster (89% clustered, compared to 76% clustered in the Survey Region as a whole) in the case of the Pondori and a lower tendency in the Dune regions (40% clustered, compared to 76%). Dunes again provide an exception in the case of 'elaborated' clusters (i.e., those with greater than 5 sites); Dune regions have no 'elaborated' clusters at all, compared to 24% for the Survey Region as a whole.

When the expression of clustering is compared within soil/landform categories, there is less uniformity. Those categories with a tendency towards high clustering are Middle Plain-Loam (95% clustered, compared to 76%

Table 5.15 Numbers of Sites within Clusters

(c=total number of clusters)

Regional Divisions	Sites in Clusters	Clay Channel	Sand Channel	Deep Clay	Middle Plain Loam	Low Plain	Middle Plain Sand	Light Levee	Heavy Levee	Regional Totals
Pondori	single	5	4		-	3	2			14
	2	3	3		1	1	-			8
	4	1 (c=9)	4 (c=8)		1 (c=3)	- (c=1)	3 (c=5)			9 (c=26)
	7	2	1		1	-	1			5
	11	1	-		-	-	1			2
	16	2	-		-	-	-			2
Nyansaṇnari	single							1	4	5
	2							1	-	1
	4							- (c=1)	- (c=1)	- (c=2)
	7							-	-	-
	11							-	-	-
	16							-	1	1
Jenneri	single	13	21		1	8	1	1		45
	2	-	4		-	4	1	-		9
	4	6 (c=7)	5 (c=11)		- (c=0)	1 (c=5)	1 (c=2)	- (c=0)		13 (c=25)
	7	1	-		-	-	-	-		1
	11	-	2		-	-	-	-		2
	16	-	-		-	-	-	-		-
Derari	single	4	1		-	2	16			23
	2	-	-		4	-	8			12
	4	- (c=1)	1 (c=4)		- (c=4)	- (c=1)	4 (c=13)			5 (c=23)
	7	-	2		-	1	1			4
	11	1	1		-	-	-			2
	16	-	-		-	-	-			-
Dunes	RED DUNE: single	4	1	1	-	-	- (c=2)	YELLOW DUNE: single	5	- - - - - (c=0)	single	9
	RED DUNE: 2							YELLOW DUNE: 2			2	1
	RED DUNE: 4							YELLOW DUNE: 4			4	1 (c=2)
	RED DUNE: 7							YELLOW DUNE: 7			7	-
	RED DUNE: 11							YELLOW DUNE: 11			11	-
	RED DUNE: 16							YELLOW DUNE: 16				
Landform Totals	single	22	26		1	13	19	2	4	96
	2	3	7 (c=23)		5	5	9	1	-	31
	4	7 (c=17)	10		1 (c=7)	1 (c=7)	8 (c=20)	- (c=1)	- (c=1)	28
	7	3	3		1	1	2	-	-	10 (c=78)
	11	2	3		-	-	1	-	-	6
	16	2	-		-	-	-	-	1	3

TABLE 5.15

Numbers of Sites within Clusters

Table 5.16 Degree of Clustering

Regional divisions	Clay channel	Sand channel	Middle plain-loam	Low plain	Middle plain-sand	Light levee	Heavy levee	Regional totals
Pondori	59 sites 5 single 54 in clusters 91% clustered	32 sites 4 single 28 in clusters 87% clustered	11 sites 0 single 11 in clusters 100% clustered	5 sites 3 single 2 in clusters 40% clustered	28 sites 2 single 26 in clusters 92% clustered			135 sites 14 single 121 in clusters 89% clustered
Nyansannari			1 site 1 single 0 in clusters 0% clustered			3 sites 1 single 2 in clusters 66% clustered	15 sites 4 single 11 in clusters 73% clustered	19 sites 6 single 13 in clusters 68% clustered
Jenneri	38 sites 13 single 25 in clusters 65% clustered	65 sites 21 single 44 in clusters 68% clustered	1 site 1 single 0 in clusters 0% clustered	21 sites 8 single 13 in clusters 62% clustered	5 sites 1 single 4 in clusters 80% clustered	1 site 1 single 0 in clusters 0% clustered		131 sites 45 single 86 in clusters 66% clustered
Derari	12 sites 4 single 8 in clusters 67% clustered	25 sites 1 single 24 in clusters 96% clustered	8 sites 0 single 8 in clusters 100% clustered	9 sites 2 single 7 in clusters 78% clustered	50 sites 16 single 34 in clusters 68% clustered			104 sites 23 single 81 in clusters 78% clustered
Dune								15 sites 9 single 6 in clusters 40% clustered

Table 5.16 continued

Regional divisions	Clay channel	Sand channel	Middle plain-loam	Low plain	Middle plain-sand	Light levee	Heavy levee	Regional totals
	109 sites	122 sites	21 sites	35 sites	83 sites	4 sites	15 sites	406 sites
Landform	22 single	26 single	1 single	13 single	19 single	2 single	4 single	96 single
Totals	87 in clusters	96 in clusters	20 in clusters	22 in clusters	64 in clusters	2 in clusters	11 in clusters	308 in clusters
	80% clustered	80% clustered	95% clustered	63% clustered	77% clustered	50% clustered	73% clustered	76% clustered

in the Survey Region as a whole) and Clay Channel, with a high number of 'elaborated' clusters (41% of elaborated clusters, compared to 24% in the Survey Region as a whole). The soil/landform category with a low expression of clustering is Light Levee (50% clustered, compared to 76% in the Survey Region); this is complemented in the case of the Light Levee by an observation of 0% 'elaborated' clusters, compared to 24% in the whole Survey Region.

Although there appears to be no strong tendency towards clustering in any landform or geographical category as a whole (with the exception of the MP-Loam), several strong trends appear at the level of different landforms within each regional division:

High:	Pondori (89% clustered)	— Middle Plain-Loam at 100% clustered
	(35% elaborated)	— Clay Channel at 56% elaborated
	Derari (78% clustered)	— Sand Channel at 96% clustered
		— Middle Plain-Loam at 100% clustered
	(26% elaborated)	— Sand Channel at 75% elaborated
		— Low Plain at 100% elaborated
		— Clay Channel at 100% elaborated
	Clay Channel (80% clustered)	— Pondori at 96% clustered
	Sand Channel (80% clustered)	— Derari at 96% clustered
	Middle Plain-Sand (77% clustered)	— Pondori at 92% clustered
Low:	Pondori (89% clustered)	— Low Plain at 40% clustered
	(35% elaborated)	— Sand Channel at 13% elaborated
		— Low Plain at 0% elaborated
	Jenneri (12% elaborated)	— Low Plain at 0% elaborated
		— Middle Plain-Sand at 0% elaborated
	Middle Plain-Loam (95% clustered)	— Nyansannari at 0% clustered
		— Jenneri at 0% clustered
	Low Plain (63% clustered)	— Pondori at 40% clustered

These observations of the clustering phenomenon lead to the following general statements. Clustering in principle increases with bathymetric depth, with the three deepest occupied soils (Clay Channel, Sand Channel, and Middle Plain-Loam) displaying the greatest number of sites found within clusters compared to all sites. These deep floodplain soils also display the greatest tendency towards 'elaborated' clusters containing five or more sites each. Displaying a strong trend towards isolation are lands permanently above water, viz., Light Levee, red Dune, yellow Dune, and Heavy Levee. Once again, occupation of highland areas in the past proceeded under different, and often quite modern rates. The single cluster of twelve sites on Heavy Levee soil is located within a splay channel (bras de crue) feeding floodwaters to the Pondori basin from the Bani River and is on the frontier between the Nyansannari and the Pondori — and so is an understandable anomaly. However, it may not be a case simply of correlating clusters composed of many sites with the lowest region or with the first abandoned parts of the Survey Region. Four of the

nineteen clusters (or 21%) containing five or more sites are located within four kilometres of Jenne. This area boasts some of the highest soils of the Pondori, where more of the most-recently abandoned sites may be found. Once again the unusual circumstances of the Jenne area are manifested.

It is not immediately obvious from the surface remains whether the different sites of each cluster represent ethnic differences (as in some of the paired villages of the Inland Niger Delta today, e.g., Souman-Bambara and Souman-Bozo), functional differences (as Szumowski [1954:107] believed to be the case at the mounds comprising the sites of Fatoma, Kami and Nantaka near Mopti), or spatial shifts through time of the same settlement. Perhaps as the settlement grew smaller, the periphery of the mound was broken up by masons collecting walling mud, or perhaps the small sites represent low-water occupation for families who annually fled to the (higher) major site at the rise of the floods. In order to begin to test whether clusters represent chronological patterns, we formally recorded more than one site within each of four clusters near Jenne. In cluster 291-E-5, sites 5B and 5C were abandoned during Phase IV, probably midway through, and site 5A was abandoned perhaps slightly later, but still well within Phase IV. If Jenne-jeno is included in cluster 159-E-11 (as it would be in the working definition), site 11D was abandoned within Phase III, site 11C and Jenne-jeno within the latter half of Phase IV and site 11H within Phase V. In cluster 159-E-12, both sites 12-B and 12-C were deserted during the latter half of Phase IV. Sites 14-A and 14-C of cluster 159-E-14 were both abandoned during Phase V. Thus only one of the four clusters appears to support the hypothesis of sequential development.

In order to escape the possible anomalous effect of proximity to Jenne, we may view dates of other clusters. All three sites within 155-T2-A were deserted during Phase III (but these were probably a special class of site). Sites 293-23-A and 23-B were both deserted during mid-late Phase IV. Sites 293-2-B and 2-D were both abandoned after Phase IV, but before Phase V. Site 291-11-B was abandoned in mid-Phase IV but 291-11-A was likewise abandoned after Phase IV, but before Phase V. And sites 352-L in-2, 3, and 4 were abandoned within the first half of Phase IV. Thus only one of four clusters within four kilometres of Jenne and one of the five clusters beyond (four of which were selected by random process) support the hypothesis of sequential abandonments. It is true that, even if the technique of dating sites was precise to the nearest century or better and sites were shown to have been abandoned at different times, we would still not know whether or not they were occupied simultaneously. In several cases the great accumulation of cultural debris argues for some period of overlapping occupation.

Settlement Size. Another advantage of the stereoscopic aerial photographs was that the area of sites could be estimated with reasonable accuracy. The longest axis of each site and the axis perpendicular to this were measured to the nearest 0.5 mm using a magnified calibrated scale under a magnifying stereoscope. At a nominal scale of 1:50,000, this method allowed accuracy to within 25 metres. Sites were normally ellipses, and areas for the 404 visible sites and for 48 contemporary settlements in the Survey Region were calculated by using the formula for the area of an ellipse. Areas calculated in square metres were then converted for display to ares (100 m^2) or hectares

10,000 m^2 = c. 2.5 acres). For example, Jenne-jeno measures 15-by-11 millimetres on the aerial photographs, which yields an area of 323,977 square metres or 32.4 ha. Instrument survey of the mound yielded an area of 330, 810 square metres or 33.1 ha, a respectable agreement for so primitive a method of estimation.

In this method of estimating site areas we assume a constant nominal scale on each aerial photograph and we assume that the difference in scale encountered as one moves from the nadir of the photograph will not badly affect the results. But because of these and other potential errors in observation, and in order to more efficiently display the range of site sizes, the range was divided into twenty-two frequency distribution classes of arithmetic (additive) progression (Table 5.17). The interval of increment by which the range of each class increases is obtained by adding a constant, 500 square metres, to the cumulative progression. The range interval of the first class is 500 square metres, or 350 to 850 square metres; the second increases by 500 to 1000 square metres, or 851 to 1850 square metres; the third by 1500 to 1851 to 3350 square metres, and so forth. The lower end of the first class (350 square metres) was arbitrarily chosen as a value sufficient to include sites smaller than the lowest possible measurement (i.e., 25 m — by — 25 m = 491 m^2), and yet large enough still to be seen on the aerial photograph. A site would have to be 10.6 metres-by-10.6 metres to fall under the range, and so small a site would almost certainly not be recognized under the steroscopes. The argument was presented above that all sites on the floodplain are large enough (and have sufficient relief) to be seen on the aerial photographs.

Classes 1-19 increase according to this progression; classes 20, 21, 22 were arbitrarily given the values >10.0 ha, <20.0 ha; >20.0 ha, <30.0 ha; and >30.0 ha respectively

The numbers of sites within each of the twenty-two frequency distribution classes are arranged by geographical region and soil/landform categories in Table 5.18; Table 5.19 lists comparable data for modern settlements. Within many of these region and soil categories the mean surface area and standard deviation (using the formula for standard deviation of a Sample (S) because the Survey Region is part of the larger upper Inland Niger Delta) are obtained by considering the midpoint of the frequency distribution classes as the variate for each class (Thomas 1976: 65-66, 76-81). Because classes 20-22 were not obtained by cumulative additive progression these were not included when deriving mean and sample standard deviation; their numbers are indicated as a percentage of all sites within each class. Since we are interested both in the central tendency, or mean of site sizes, and in the degree of variation from this mean, the Sample standard deviations have been converted to a coefficient of variation ($CV = \frac{100 \times S}{X}$) in order that we may compare these summary statistics from all categories (standard deviations can only be compared if the means are nearly identical). Thomas (1976: 66) discusses the degree of inaccuracy experienced by using the midpoints of frequency distribution classes rather than each individual datum (i.e., area of each site) when calculating mean and coefficient of variation; acceptable inaccuracies were obtained in a test of the two methods with the grand totals of villages $\bar{X}$ = 1.98 ha, C. V.

Table 5.17 Display of Site Sizes: Frequency Distribution Classes

	Range	Midpoint (m^2)	(Increment) (m^2)
1.	3.5-8.5 ares	600	+500
2.	8.5-18.5 ares	1350	+1000
3.	18.5-33.5 ares	2600	+1500
4.	33.5-53.5 ares	4350	+2000
5.	53.5-78.5 ares	6600	+2500
6.	78.5-108.5 ares	9350	+3000
7.	108.5-1.44	12600	+3500
8.	1.44-1.84 ha.	16350	+4000
9.	1.84-2.29 ha.	20600	+4500
10.	2.29-2.79 ha.	25350	+5000
11.	2.79-3.34 ha.	30600	+5500
12.	3.34-3.94 ha.	36350	+6000
13.	3.94-4.59 ha.	42600	+6500
14.	4.59-5.29 ha.	49350	+7000
15.	5.29-6.04 ha.	56600	+7500
16.	6.04-6.84 ha.	64350	+8000
17.	6.84-7.69 ha.	72600	+8500
18.	7.69-8.59 ha.	81350	+9000
19.	8.59-10.00 ha.	90600	+95000
20.	Greater than 10.0 and less than 20.0 ha.		
21.	Greater than 20.0 and less than 30.0 ha.		
22.	Greater than 30.0 ha.		

TABLE 5.18
Size of Sites

10:2 = Frequency distribution class:*Number*

	Clay Channel	Sand Channel	Deep Clay	Middle Plain - Loam	Low Plain	Middle Plain - Sand	Light Levee	Heavy Levee	TOTALS	
Pondori	1:12 10:2 2:1 11:1 3:7 13:1 4:8 15:1 5:2 18:1 6:12 19:1 7:2 20:3 8:1 22:2 9:2	1:8 3:9 4:3 6:7 7:1 8:1 9:1 11:2		1:6 3:2 5:1 9:1 10:1	6:3 7:1 15:1	1:7 3:9 4:2 5:1 6:4 8:1 9:1 15:2 18:1			1:33 10:3 2:1 11:3 3:27 13:1 4:13 15:4 5:4 18:2 6:26 19:1 7:4 20:3 8:3 22:2 9:5	$\bar{X}$=1·08ha S=1·66; CV=154 n=122[+5(>10ha)=3·9%]
Nyansunnari				3:1			3:1 6:2	1:3 9:1 3:4 10:1 6:2 12:1 7:3	1:3 9:1 3:6 10:1 6:4 12:1 7:3	$\bar{X}$=0·92ha S=0·96; CV=104% n=19
Jennéri	1:6 9:2 3:14 11:2 4:3 17:1 5:1 6:5 7:2 8:2	1:18 8:7 2:3 9:3 3:14 10:3 4:6 11:1 5:1 14:2 6:3 18:1 7:3		7:1	1:4 3:8 6:2 7:3 8:2 9:2	1:1 4:1 6:1 8:1 14:1	7:1		1:29 8:12 2:3 9:7 3:37 10:3 4:10 11:3 5:2 14:3 6:11 17:1 7:9 18:1	$\bar{X}$=0·92ha S=1·3; CV=141% n=131
Dérari	1:4 3:2 4:1 5:1 7:2 9:1 17:1	1:11 3:8 4:1 7:1 8:3 10:1		1:3 2:1 4:1 7:1 8:1 10:1	1:3 3:4 7:1 10:1	1:14 8:2 2:1 9:2 3:11 10:4 4:4 11:3 5:5 14:1 6:1 16:1 7:1			1:35 8:6 2:2 9:3 3:25 10:7 4:7 11:3 5:6 14:1 6:1 16:1 7:6 17:1	$\bar{X}$=1·09ha S=1·04; CV=95% n=104
Dunes							RED 4:1 14:2 6:3 7:2 8:2	YELLOW 3:1 6:2 9:2	Dune Total 3:1 8:2 4:1 9:2 6:5 14:2 7:2	$\bar{X}$=1·69ha S=1·42; CV=84% n=15
Landform Totals	1:22 10:2 2:1 11:3 3:23 13:1 4:17 15:1 5:4 17:2 6:17 18:1 7:6 19:1 8:3 20:3 9:5 22:2 $\bar{X}$=1·19ha S=1·68; CV=141% n=96[+5(>10ha)=5%]	1:37 10:4 2:3 11:3 3:31 14:2 4:10 18:1 5:1 6:10 7:5 8:11 9:4 $\bar{X}$=0·78ha S=1·1; CV=141% n=122		1:9 2:1 3:3 4:1 5:1 6:2 7:1 8:1 9:2 $\bar{X}$=0·55ha S=0·68; CV=124% n=21	1:7 3:12 6:5 7:5 8:2 9:2 10:1 15:1 $\bar{X}$=0·86ha S=1·08; CV=126% n=35	1:22 10:4 2:1 11:3 3:20 14:2 4:7 15:2 5:6 16:1 6:6 18:1 7:1 8:4 9:3 $\bar{X}$=1·07ha S=1·62; CV=151% n=83	3:2 6:2 $\bar{X}$=0·61ha S=0·39; CV=64% n=4	1:3 3:4 6:2 7:3 9:1 10:1 12:1 $\bar{X}$=1·01ha S=1·05; CV=104% n=15	1:100 8:23 15:4 2:6 9:18 16:1 3:96 10:14 17:2 4:31 11:9 18:3 5:12 12:1 19:1 6:47 13:1 20:3 7:24 14:6 21:- 22:2 Classes <10ha: $\bar{X}$=0·95ha S=1·59; CV=167% n=399[+(20)3+(22)2=$\frac{5}{504}$=1·2%]

TABLE 5.19

Size of Villages

10:2 = Frequency distribution class:*Number*

Classes <10ha:

$\bar{X}$=1·98ha

S=1·59; CV=80% (Sample σ)

n=44[+(20)3+(22)1=$\frac{4}{48}$=8·3%]

	Clay Channel	Sand Channel	Deep Clay	Middle Plain Loam	Low Plain	Middle Plain Sand	Light Levee	Heavy Levee	TOTALS	
Pondori	8:*1* 20:*1* 22:*1*	10:*1* 14:*1*		10:*1*	6:*1* 17:*1*	6:*1* 8:*1* 16:*1*			6:*2* 8:*2* 10:*2* 14:*1*	16:*1* 17:*1* 20:*1* 22:*1*
Nyansannari							12:*1* 13:*1*	3:*1* 9:*1*	3:*1* 9:*1*	12:*1* 13:*1*
Jennéri	6:*1* 9:*1* 10:*1*	4:*1* 5:*1* 6:*2*			7:*2* 8:*1*	7:*1*	3:*2* 6:*1* 11:*1*		3:*2* 4:*1* 5:*1* 6:*4* 7:*3*	8:*1* 9:*1* 10:*1* 11:*1*
Dérari		8:*1* 10:*1*				7:*2* 8:*1* 9:*1* 10:*1* 11:*1*			7:*2* 8:*2* 9:*1* 10:*2* 11:*1*	
Dunes							RED 4:*1* 6:*2* 14:*1*	YELLOW 4:*1* 6:*1* 10:*2* 20:*2*	Dune Total 4:*2* 6:*3* 10:*2* 14:*1*	20:*2*
Landform Totals	6:*1* 8:*1* 9:*1* 10:*1* 20:*1* 22:*1*	4:*1* 5:*1* 6:*2* 8:*1* 10:*2* 14:*1*		10:*1*	6:*1* 7:*2* 8:*1* 17:*1*	6:*1* 7:*3* 8:*2* 9:*1* 10:*1* 11:*1* 16:*1*	3:*2* 6:*1* 11:*1* 12:*1* 13:*1*	3:*1* 9:*1*	3:*3* 4:*3* 5:*1* 6:*9* 7:*5* 8:*5* 9:*3* 10:*7*	11:*2* 12:*1* 13:*1* 14:*2* 16:*1* 17:*1* 20:*3* 22:*1*

= 80% for frequency distribution classes versus $\bar{X}$ = 1.93 ha, C. V. = 82%) and all sites on Middle Plain-Loam soils ($\bar{X}$ = 0.55, C. V. = 124% versus $\bar{X}$ = 0.63, C. V. = 135%). In both tests the means fall within the same third of one frequency distribution class and the coefficients of variation are sufficiently close for present purposes.

Ancient sites display a smaller mean size than modern villages (0.95 ha, compared to 1.98 ha). The coefficient of variation of ancient sites is greater than double that of modern villages (167% versus 80%), meaning that the sites varied more consistently than do villages. In addition to being on the whole larger, more of the total number of modern settlements are larger than ten hectares in area (n = 4 or 8.3% versus n= 5 or 1.2% of sites). However, many large settlements occupied today were long occupied in the past. These very large settlements are concentrated in the Clay Channel parts of the Pondori (two of four modern settlements and five of five very large ancient sites). On the other hand, 106 of the 404 ancient sites (or 26.2%) are under 0.185 hectares (18.5 ares) in area (classes 1 and 2), whereas no villages are this small. The overall trend is from (clustered) variably-sized and often many small settlements to fewer, isolated settlements which are larger in area and less variable in size. The totals of site sizes show distribution with two peaks at classes 1-3 and 6-11, whereas the distribution of village size displays the peak at the classes 6-10 (or 0.785 to 2.79 hectares) (Figure 5.1). Because of the failure in the field to record formally all sites in chosen clusters, all sites of all phases must be lumped together. Therefore, it is impossible for the moment to determine when and at what rate the movement towards the modern pattern of size and distribution became apparent.

Figure 5.2 is an attempt to display the same lumped site and village size data in a form perhaps more familiar to the reader. Rather than employ frequency distribution class information (utilised for Figure 5.1), site and village sizes in Figure 5.2 are derived from the individual measurements of each settlement. Both number and size of settlement are plotted along a logarithmic scale. In this form the distribution of ancient sites appears very similar to that of the rank-size pattern familiar to geographers (Haggett 1965; Johnson 1977). The application of geographical models of locational analysis such as the rank-size rule is discussed in the following chapter.

Of the five geographical regions in the Survey Region, the sites on Dunes have the highest mean size (1.68 ha) and the lowest coefficient of variability (84%). These figures are interesting in light of the fact that the sites on the Dunes are the earliest abandoned, but these results are not comparable because of the unusual nature of sites on the Dune (the 'tumulus-groups'). The Nyansannari boasts more of the most recently-abandoned sites (all of which, however, were not visible on aerial photographs), but the mean size of sites on the Nyansannari is low (0.82 ha) and the coefficient of variability is higher than that of the Dereri or dunes. The Pondori has the highest coefficient of variability in the floodplain (154%), and all of the sites greater than 10.0 hectares in area.

There is great variability between the seven soil/landform categories. The mean area of sites is very low in the Middle Plain-Loam soils (0.55) and Light Levees (0.61 [small n]) and quite small on the Sand Channel (0.78 ha).

FIG. 5·1

Size of Sites and Villages

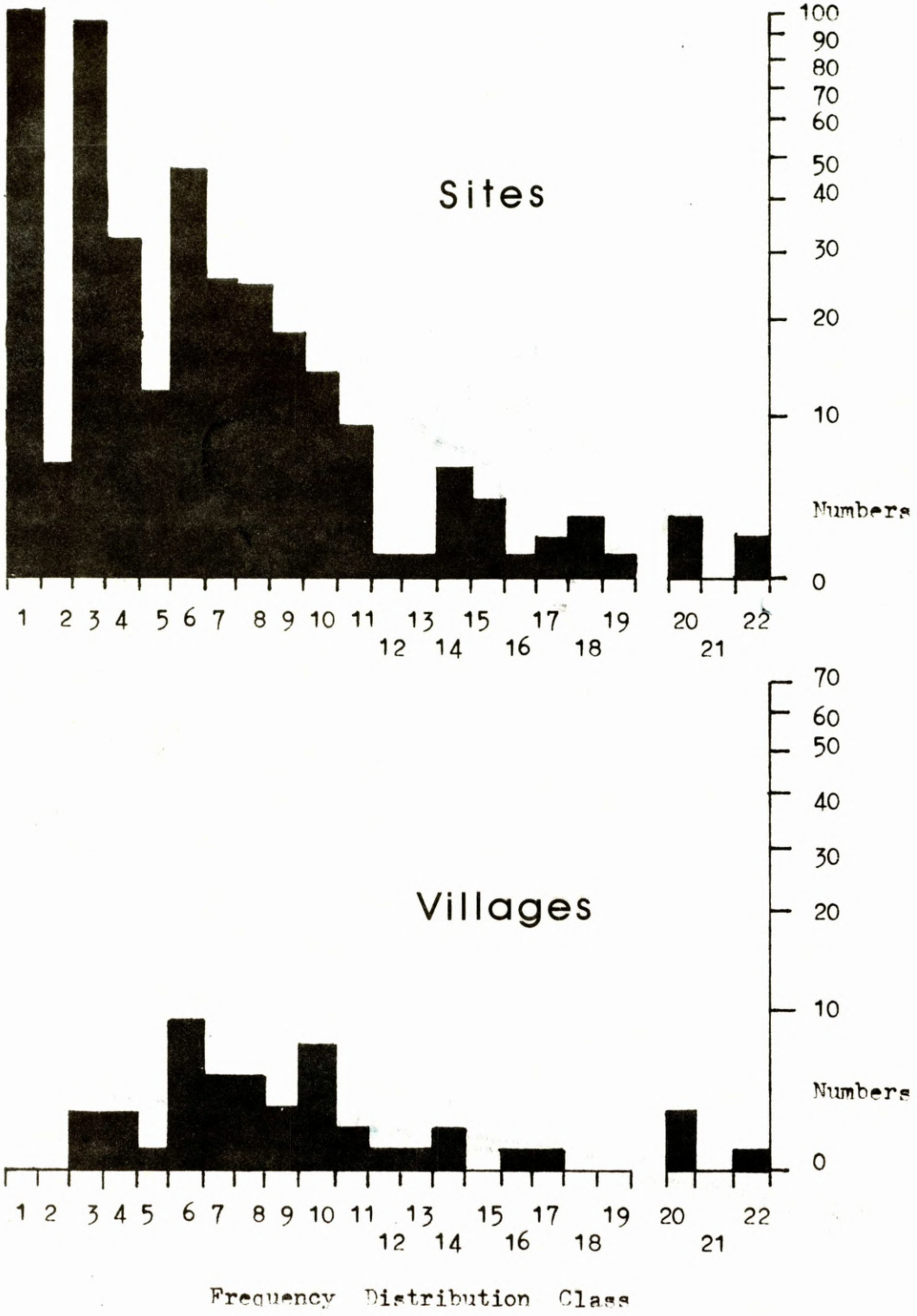
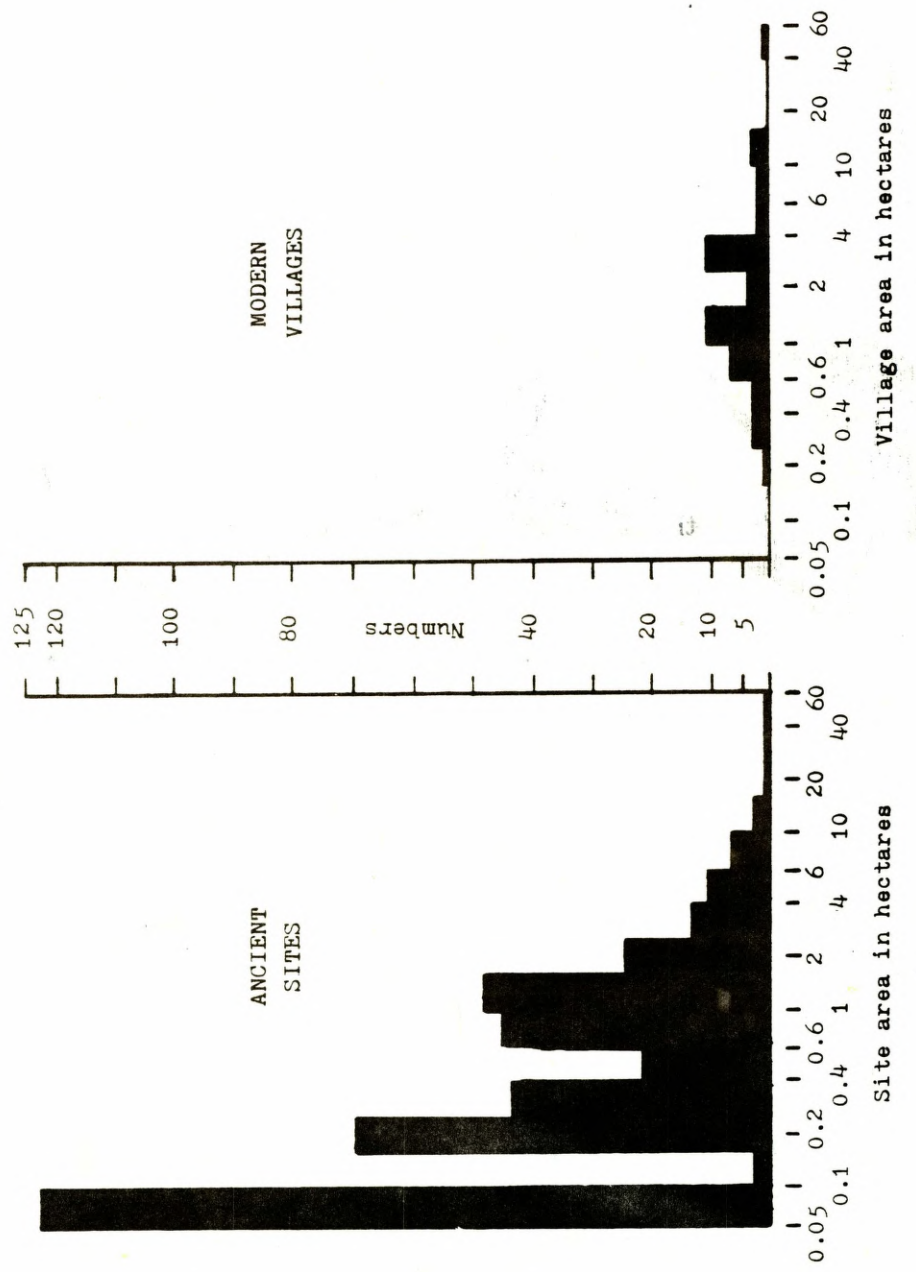


FIG. 5·2

Hectare Sizes



Clay Channel soils boast the largest mean site size (1.19 ha). The coefficients of variability of all floodplain soils are significantly higher than those of the highland soils (>124% versus <104%). Once again, recognition of these patterns is not the same as explaining the reasons why they came to be, but their recognition does allow more specific questions to be asked and, hopefully, answered during future survey.

As a final exercise the site areas estimated from aerial photographs were compared to those derived by pacing the formally-recorded sites. Table 5.20 lists only those sites at which confidence in surface coverage was better than 'C'. This is a test of how badly various factors in the field interfered with accurate pacing. On the whole the record is quite good: 15 of the 27 estimations (56%) fall within the frequency distribution class obtained from aerial photographs, 19 (70%) fall within $\pm$ 0.05 ha (500 m^2) of the class range. 23 (85%) fall within $\pm$ 0.3 ha (3,000 m^2), and only three (11%) were greater than + 0.5 ha (5,000 m^2). Unfortunately, two of these three (both greater than 2 ha deviation) were assigned an 'A' value of confidence. Rather than simple inaccuracy of the metre-pace over long distances, the factors accounting for most lack of agreement are probably thorn-cover (especially at the periphery, where it is difficult to determine the edge of the site if undergrowth is thick, the lengthening of the path over a high and hemi-spherical site (the formula use is, of course, for a plane-figure ellipse), and the difference in values obtained by measuring the N-S, E-W axes on the one hand, and the longest axis and that perpendicular to the first on the other.

Analysis of Artefacts and Features. Frequency of occurence of the thirty-four classes of artefacts and features observed on the surface of mounds are listed by Phase in Table 5.21. Only a few of these were not found on the surface at Jenne-jeno (fired bricks [G], gunflints [Z], tobacco pipes [CC], ceramic stools [FF], and large sandstone slabs [GG]). Jenne-jeno was the only site with certain evidence of a city wall (EE) (although the remains of walls may be hidden by thorns around the periphery of other sites).

Dwellings: The building technology shows some change through time. Round houses of cylindrical bricks called jennefre (D) form the majority of houses of recognizable shape during Phase IV (54%). (They are also found at two of the Phase III sites; at Jenne-jeno a tauf house was found in early Phase III deposits in Mound 1 and a round house of cylindrical bricks at the end of Phase III-early Phase IV in Jar Field 1.) After Phase IV, but before Phase V this percentage falls to 46% and in Phase V to 39%. Rectangular houses of cylindrical bricks (E) rise from 37% in Phase IV to 51% in Phase IV-V and 46% in Phase V. Rectangular houses of rectangular brick (C) are 6% in Phase IV, 2.5% in Phase IV-V and then 15% in Phase IV. Total construction in cylindrical brick (A, D, and E) drops from 96% in Phase IV and 98% in Phase IV-V, to 90% in Phase V. Construction in jennefre has always been associated with the mason caste of Jenne and during the fourteenth and fifteenth centuries these masons worked throughout the Inland Niger Delta and in the Segou region (Prussin 1973b). The apparent increase in construction in jennefre from c. A. D. 1300-1600 may reflect the growing importance of that construction tradition, whereas the drop after c. A. D. 1600 may reflect the intrusion of new ethnic groups with customs of building in other technologies

Table 5:20 Estimation of size of sites

Site	Paced (m^2)	AP Range (m^2)	Deviation
291-E-2	8,207	10,851-14,350	-2,644
291-E-3	22,368	18,351-22,850	
291-E-4	9,071	7,851-10,850	
291-E-5-B	4,948	5,351-7,850	-403
291-E-5-A	70,686	class 20	-29,314
291-E-6	400,553	class 22 (410,371)	
159-E-11-A	92,363	85,851-100,000	
159-E-11-C	28,493	18,351-22,850	+5,643
159-E-11-D	15,119	10.851-14,350	+769
159-E-11-H	13,744	7,851-10,850	+2,894
159-E-12-B	30,631	27,851-33,350	
159-E-15-A	18,072	18,351-22,850	-279
159-4	30,725	52,851-60,350	-22,126
159-6-A	19,792	22,851-27,850	-3,059
159-T13-A	14,137	10,851-14,350	
155-T2-A(M)	17,671	14,351-18,350	
155-T9-A	17,671	14,351-18,350	
291-11-A(top)	25,918	22,851-27,850	
293-2-B	8,679	10,851-14,350	-2,172
293-2-C	5,498	3,351-5,350	+148
295-10-A	2,121	1,851-3,350	
352-Lin-2	31,220	27,851-33,350	
352-Lin-3	5,655	5,351-7,850	
352-Lin-4	18,162	18,351-22,850	-189
379-Lin-5	12,763	10,851-14,350	
379-Lin-6	17,082	14,351-18,350	
379-Lin-7	51,542	45,851-52,850	

Table 5.21 Occurrence of Surface Remains (see Appendix III) (4; 5x = 4 counted; reported at 5 separate sites additionally)

	III	IV	IV-V	V
A. House; ? shape, cylindrical brick	5	197	74	27
B. House; round, rectangular brick	0	1	1	1?
C. House; rectangular, rect. brick	0	21 (3?)	4	7
D. House; round, cylindrical brick	5	179	73	18
E. House; rectangular, cylindrical brick	0	132	81	21
F. Other structures	0	3x	1x	0
G. Fired brick	0	2x	25; 1x	2; 1x
H. Potsherd pavement (?)	0	7; 1x	0	1
I. Ceramic bedrest	0	1x	1x	0
J. Funerary urns; NE quadrant	10	173	103	37
K. Funerary urns; SE quadrant	7	255	91	22
L. Funerary urns; SW quadrant	3	104	40	24
M. Funerary urns; NW quadrant	5	72	56	14
N. Muslim burials	0	2; 1x	1; 2x	0
O. Slag scatter-overall	2x	15x	7x	7x
P. Slag concentrations	3x (1)	10x (6 sites)	11x (5 sites)	10x (6 sites)
Q. Furnace remains	0	1x (1?)	1x (1?)	1x
R. Tuyère	1	1x (1?)	1x	1x
S. Iron artefacts	0	1x	1x	1x
T. Crucible	1	1x	0	0
U. Non-ferrous artefacts	0	2; 1x	2x	1; 1x
V. Net weights	1	2; 8x	15; 2x	7; 1x
W. Spindle whorls	0	6; 2x	3; 3x	2x
X. Loom weights	0	1x	8; 1x	2
Y. Grinding stones	0	1x	1x	0
Z. Gunflints	0		0	1

Table 5.21 contd.

		III	IV	IV-V	V
AA.	Cowries	0	1x	1	1; 1x
BB.	Statuettes	0	4; 1x	0	0
CC.	Tobacco pipes	0	0	0	10; 2x
DD.	Beads or bracelets	0	2x	3x	3
EE.	Defensive wall	0	1x	0	1?
FF.	Ceramic stool	0	0	1x	0
GG.	Sandstone slabs	0	4	0	1?
HH.	All other				
		n=1; $\bar{X}$=1.11	n=19; $\bar{X}$=1.02 S=0.4; CV=39.2%	n=7; $\bar{X}$=1.36 S=0.58; CV=42.6%	n=5; $\bar{X}$=1.38 S=0.65; CV=47.1%

and the decline of the traditional customs. Informants in Jenne recall that jennefre were still used in the town at the turn of the present century (O. Cissé: personal communication, 1977).

Within the jennefre tradition at Phase IV, most sites have a majority of round houses, but some a clear majority of rectangular buildings (291-E-2, 159-E-12-C, 291-11-B, and Jenne-jeno). Whether this difference reflects ethnic preferences or whether the difference would evaporate if the true shape of all 'indeterminant' (A) houses were known cannot be said at the present.

A though there are fired, rectangular bricks (G) at sites abandoned during Phase IV (generally undecorated), 93% of bricks which were counted and all slipped and design-incised bricks are from sites abandoned after Phase IV. On the other hand, 88% of all possible potsherd pavements (H) were found at sites abandoned during Phase IV.

Burials: Although most burials in large urns occured during Phase III at Jar Field 1 at Jenne-jeno, only one site abandoned during that phase had an urn cemetery (159-E-11-D). This may be because of the special function of the other sites ('tumulus' group' and associated site?) or because of their location on the dune. Funerary urns are most common at sites abandoned during Phase IV (59%) and, perhaps predictably with the gradual penetration of Islam, urns occur less commonly at Phase IV-V sites (28.3%) and less commonly still at Phase V sites (9.5%). Throughout, there is a clear tendency for urn cemeteries to be located on the eastern side of settlements (J and K) (Phase III — 68% Phase IV — 71%, Phase IV-V — 67%, Phase V — 61%). This apparent preference is probably not an artefact of erosion, because the winds bear from the SSW-WSW during the rainy season (Gallais 1967, I: 48, Fig. 7) and as many sites are now being undercut by migrating streams on their western side as on their eastern side. These average figures do mask some considerable variation in preference for the four quadrants (J, K, L, and M) and only further research will establish whether we see in this diversity ethnic performance, elite quarters within a settlement, or other factors. Muslim burials (N) were rare at early sites, but in a few cases abandoned sites near more recent villages have been taken over for that purpose (because of the paucity of land above the floods; e.g., 291-E-7, 293-2-D, 352-Lin-1).

Industry: Both of the two settlement sites of Phase III were covered with slag (D) and site 151-E 11-D had three marked concentrations (P). Fifteen of the twenty-three Phase IV sites were covered with slag (65%); there were ten concentrations at six of these sites. All Phase IV-V sites were covered with slag; and there were eleven concentrations at five of these. All Phase V sites were covered with slag and there were ten concentrations at six of these. These concentrations of slag were probably remains of industrial activity, although evidence in the form of furnace remains (Q) or tuyères (R) was surprisingly rare (five possible of the former and five occurances of the latter; at seven sites). A total of thirty-one sites (74%) were covered with slag (>5 pieces/m^2); eighteen (43%) boast strong concentrations of slag (34 concentrations) and seven sites with slag concentrations (17%) show additional evidence of iron production. Abundant slag was found in all phases of occupation at Jenne-jeno. Such strong evidence of a long history of local iron production

in considerable quantity is surprising in light of the lack of high-grade ore in the Inland Niger Delta. It perhaps suggests either that there are concentrations of low-grade ore such as limonite in the Delta, which were roasted before smelting (and which account for the large quantities of slag) or that there developed a very early and voluminous trade outside the alluvial Delta for ore, rather than for the finished products of the smelt. It also suggests that the Delta once supported more woodlands. As at Jenne-jeno, evidence of non-ferrous metals is relatively rare (T, U.).

Portable Artefacts: Table 5.21 lists the frequency of occurance of evidence of occupations (V—A. A.) and customs (BB-DD). The presence of spindle whorls and tobacco pipes were used as secondary evidence in the dating of abandonment of sites. It is interesting that all five instances of human representation (statuettes and modelled relief on pottery) were found at Phase IV sites; the statuette and anthropomorphic representation in relief at Jenne-jeno were from the Phase IV levels of Mound 2. Four large sandstone slabs, clearly imported from outside the Delta, rest on Phase IV sites. These are much larger than 'stelae' marking muslim graves and no engraving of an epitaph is evident.

A final item of the miscellaneous category (HH) is the occurence of calcareous nodules (perhaps evidence of higher flooding). The four occurences are at the Phase III site in the floodplain (159-E-11-D), at the end of Phase III deposits at Jenne-jeno (below Level 1 and House 1 at JF1, and below debris transported more recently from the centre of the mound, in Level 1, M1 of Jenne-jeno, and at a lower slope of a Phase IV site (352-Lin-4). This circumstantial evidence supports the belief in a more humid period from c. A. D. 700 to perhaps as late as A. D. 1200, when improved rainfall in the headwaters regions may have caused more flooding (vide infra).

Complexity Analysis: The relative complexity of each site is measured by a crude index of complexity obtained by counting the number of classes of remains recorded at each site (A to HH = 34) and by then dividing the sum by nine (the number of the classes occuring most frequently: A, C, D, E, J, K, L, M, O). This is not to imply that these nine classes must occur in sites registering 1.0 on the index; the index is simply an arbitrary device to reduce the possible thirty-four classes to a form more convenient for visual examination. Results of the index range from 0.0 (generally sites badly disturbed by recent activity, but at which surface sherds were nevertheless available for tentative dating) to 2.56 (Jenne-jeno).

The major weakness in the method is lack of uniformity of observation. An honest effort was made to allot time for the surface search proportionate to the size of the site, but there were cases in which a site was less-completely recorded because of insufficient time or, more often the case, because our water was exhausted. More serious problems were the obscuring of surface features by thorn bushes and dust, or the removal of those features by farmers. Perhaps as much as 30% of the surface of Jenne-jeno had been turned over to mango groves or, more seriously, to sorghum and millet fields; these areas were devoid of any features and even of much of a scatter of sherds. All sites on the red Dune were badly affected by recent cultivation. Other sites were completely covered by thorn bush or, more often, were ringed by a thick band

of thorn growth (e.g., fully 4/5 of the surface of site 291-11-B was impassable). Trees and thorn bushes collect dust blown during the daily dry-season wind storms, and several sites were covered by an appreciable layer of recent 'loess' (e.g., site 159-E-13-A). Ten of the forty-two sites (four of the five Phase III sites) are not included in the following analysis because of these hinderances to full recording. Another unknown is the amount of robbing (pots, beads, copper bracelets, statuettes, spindle whorls, etc.) from each site. As far as we could ascertain at Jenne, the few stalls at which these items are sold during the weekly market are recent establishments for the tourist trade. But individual items may have been sought more conscientiously in the past. Because of these doubts, there will never be an alternative to proper excavation to determine the true period of occupation and the degree of complexity of these sites. Doubts about the degree to which the recorded sample reflects the pattern of all sites in the Survey Region further limits the complexity of analysis of these data.

In Table 5.21 the mean and coefficient of variability of the index of complexity is listed by Phase. Sites abandoned during Phase IV display a mean of 1.02 and a coefficient of variability of 39.2%; those of Phase IV-V of $\bar{X}$ = 1.36 and C. V. = 42.6%, and those of Phase V of $\bar{X}$ = 1.38 and C. V. = 47.1%. The trend is towards greater complexity as one approaches the present, but the increasing coefficient of variability suggests that a few very complex (or unusually simple) sites may have had an unacceptable effect on the phases with a small number of sites. The data have also been lumped into four classes: <0.99, 1.0-1.49, 1.5-2.0, and 2.0. Although the numbers are small, there seems to be some reduction through time in the asymmetry of the elements of the four classes (94% in <1.5 in Phase IV versus 60% in Phase V). But, until further survey is undertaken in an unbiased manner, it will be impossible to know whether there is a true tendency for all sites abandoned during Phase IV to have greater homogeneity of surface remains, or whether the result here is because most Phase V sites were within easy access to Jenne, the commercial centre of the Niger Delta.

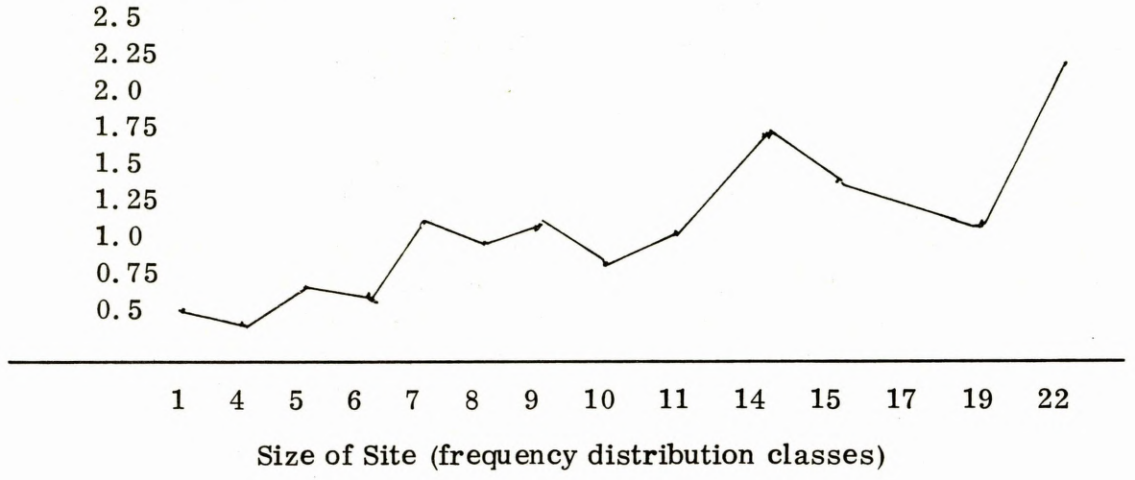
Site size and degree of complexity are compared in Table 5.22 and in general site size is a good way by which to predict complexity of remains. The exception to this are the size classes 15, 17, and 19, which reverse the positive correlation, but each of these are represented by one site only; the former two were also ringed by thorns, although the centres were free, and there is good reason to believe that the last (159-E-11-A, Hambarketolo) has been severely surface collected. One can perhaps have a little more confidence in this rather simple-minded correlation when it is understood that very large sites were more difficult to cover as carefully and uniformly as small sites, even when we attempted to allot proportionate amounts of time to each. This also, of course, assumes that all classes of surface remains had an equal opportunity to be dropped both at large and at small sites, and that all sites of all periods were equally neglected by the local 'antiquarians'. Phase III and IV sites have been exposed for a longer time to the threat of surface collection, but Phase V sites are closer to Jenne and the tourist trade.

These are complex factors and we can only guess their effect upon how well the remains on the surface reflect the homogeneity or heterogeneity of the popu-

Table 5.22 Site Size and Complexity

Size: Complexity (averaged index of complexity)

1 : 0.56 (n=1)	8 : 1.11 (n=4)	
4 : 0.45 (n=2)	9 : 1.17 (n=5)	15 : 1.56 (n=1)
5 : 0.74 (n=3)	10 : 1.0 (n=1)	17 : 1.44 (n=1)
6 : 0.71 (n=3)	11 : 1.22 (n=2)	19 : 1.22 (n=1)
7 : 1.17 (n=4)	14 : 1.89 (n=2)	22 : 2.34 (n=1)



lation occupying the site. Another complication is that sites may have areas exposed which were last occupied well before the final abandonment of the settlement (e.g., the Jar-Field area of Jenne-jeno and also, I suspect, parts of Kaniana [291-E-6]). Hence only by deep excavation of many sites can we assess the apparent trend towards a greater degree of heterogeneity with increasing size, greater asymmetry of the distribution of complex sites within a Phase during the earlier periods (i.e., more simple agricultural villages supporting fewer larger commercial centres), and the apparent smaller mean of complexity and greater overall homogeneity during the earlier periods.

An Assessment of the Survey

An informative way to review the strengths and failings of the survey is to imagine what the conclusions about past and present occupation might have been had only the areas within four kilometres of Jenne and that covered in the Linear Survey been searched for sites.

1). It would have been impossible to map the true diversity of landforms and soil types in the vicinity of Jenne. All highland features would be excluded, as would many floodplain soils. The regional diversity would be lost as well because only a fragment of the Pondori and a narrow band of the Jenneri would have been covered. Although all the sites in this imaginary restricted survey would be on floodplain soils (and all but a few on Clay Channel or Sand Channel), one could not be at all confident that all floodplain sites on all types of soils could be seen on stereoscopic aerial-pairs.

2). It would as a consequence be impossible to measure even crudely the degree to which different landforms have been abandoned or come to be favoured for occupation. The recent strong preference for high, light soils (the Light Levee and, especially, the dunes) would escape detection, as would the converse, the overall but gradual abandonment of lower floodplain soils.

3). The loss of information would be even more serious when it came to dating sites. Only one site abandoned during Phase III appears in the imaginary survey and all specialized sites of the 'tumuli-group' would be lost. On the other hand, because of the high percentage of Phase IV-V sites in the Linear Survey and within four kilometres of Jenne, and because of the unusual number of sites of Phase V (28% of recorded sites near Jenne, 17% of all sites recorded in 1977), the high concentration of more recently abandoned sites near Jenne (and near the Niger?) might be misinterpreted as a true proportion of late sites to those abandoned during Phase IV.

4). Similarly, the true proportion of sites and villages at different distances from permanent standing water would be misinterpreted because the Jenne area and Linear Survey are well served by the Souman-Bani and the Hute. Therefore, there would be no possibility to assess the hypothesis of a linear decline in the hydrology of the Inland Niger Delta taking primary responsibility for the decline in numbers of settlements. For that matter, because these areas are so well-watered there is an unusually high number of modern settlements (12, or 25%) compared to ancient sites (69, or 17% of total).

5). Because a limited number of soil types would be examined in the imaginary survey, it would not be known that generally the same rates apply to the phenomenon of clustering of sites on all soil types. The high degree of clustering in the Pondori and the opposite in the Jenneri would be apparent, but it would be impossible to test whether or not these patterns were the case over a wider area. The imaginary survey would give a very biased result to the test of numbers of sites in each cluster because of the unusually populous clusters near Jenne. The strong pattern of isolated sites and modern settlements on highland soils would escape detection completely. There is also an unusually large number of large sites and villages in the Clay Channel near Jenne (most of those greater-than ten hectares in area) and in the Linear Survey. This would badly distort the determination of

6). It would still be evidence that ancient sites cluster more than modern villages, but the proportion of very small sites (18.5 ares) would be badly under-represented. Most soils of the floodplain support sites of very low mean size, and the Clay Channel soils have the highest means of the floodplain only because of the concentration of large sites near Jenne. The fact that dune sites are on average larger and more homogeneous in size than those of all other landforms would be missed.

7). And finally, it would be impossible to investigate whether the degree of heterogeneity (complexity) of remains on the surface of sites in the imagined survey, and how it varies with period of abandonment and size of site, was the true pattern throughout the upper Inland Niger Delta, or whether Jenne and its secondary link with the Niger, the Souman-Bani were exerting unusual influence over nearby sites by making available more exotic goods and ideas.

CHAPTER 6

ANALYSIS OF THE EVIDENCE FROM THE JENNE REGION

Introduction

There is a vast and growing archaeological literature about regional settlement studies. Much of this literature draws heavily upon models and interpretive techniques developed by geographers (e.g., Hodder and Orton 1976; Plog 1976; Haggett 1972). There are several reasons why the use of most of these models is inappropriate to the information now available about past occupation in the upper Inland Niger Delta; the major reasons are reviewed here.

Contemporaneity. In every case the models which geographers test against settlement data presume that all settlements were occupied simultaneously. Archaeologists have perhaps not been sufficiently aware of this requirement when applying sophisticated interpretive techniques to archaeological data (cf. Oates 1976; for an example of one such abuse of the application of the 'nearest-neighbour' statistic, see Earle 1976).

The recording of surface pottery at sites within the Survey Region gave only tentative dating of the final occupation of the sites. Abandonment may have occurred anytime during the centuries-long Phases. At present it is not known how long the floodplain tell sites were occupied, or if that occupation was continuous and uninterrupted. It must be stressed once again that there is a danger inherent in using a pottery sequence established and radiometrically dated at one site to date other sites until the mechanisms of trade and interaction between the sites are fully understood (vide infra). Deep excavation at many sites in the neighbourhood of Jenne is needed in order to determine the length and continuity of occupation (although the latter is difficult to establish satisfactorily at tell sites with complex stratification). Extensive excavation will also provide the quality and quantity of ceramics required for tests of assemblage similarity between sites (cf. Johnson 1977: 481-482).

Size of Settlement. Many interpretive techniques (e.g., archaeological applications of the 'rank-size' rule) depend upon an appreciation of the area of the settlement at different periods of its evolution. This is a variable which is easy to measure in modern settlements, but very often difficult to estimate by the archaeologist dealing with an excavated sample which may be but a tiny fraction of the full site.

The surface area excavated during 1977 (37.5 square metres) represents one part in 8,827 of the surface of Jenne-jeno. For this reason, it is difficult to know, for example, whether the Phase II deposits in M1, M2, and JF1 are part of a single large mound, or two mounds separated by floodplain. It is difficult to know whether the final size of any site in the Survey Region

represents the full occupation at the climax of the site, or whether the deposits represent a composite of overlapping, but sequential occupations (i.e., the problem of the 'palimpsest'). Perhaps one day the characteristics of settlement in the Inland Delta will be well enough known that one could disregard this caution, but that is not now the case. Several large sites, including Jenne-jeno, Kaniana, and 159-T18-A, were apparently at their full size during Phase III, and then experienced occupation over a smaller area during later Phases. Of course, if pottery recording happened to have taken place at an early-deserted part of any site, the tentative date of abandonment will be far too early.

Momentary Population. Most geographical models require the knowledge of the size of the community at contemporaneous settlements. The analyst is required to know the size of the population and the size and numbers of subpopulations (i.e., the 'functional size' of the settlement, which includes elites, craft corporations, castes, the agricultural base, etc.) within the community. This information is then used to arrange settlements into a regional hierarchical taxonomy (Johnson 1977: 495). Archaeologists lacking this quality of information have estimated population and functional size from the final size of sites (often disregarding the problems of the palimpsest, or of superimposed occupations exposed by erosion) by applying a constant obtained through observation of modern communities, or by estimating the average numbers of persons in each household. Household numbers are estimated by measures of the area of floor, numbers of dwellings and associated activity areas, space between houses, etc. (Marcus 1976: 79-84).

The extremely crude figure of 250 persons per hectare used to estimate the population at Jenne-jeno during various Phases was obtained from recent census figures for Jenne and for other floodplain villages larger than ten hectares. This constant must be regarded with some suspicion because these large settlements have greatly increased in size during the past few decades (e.g., Gomitogo from c. 1,471 in 1939 to 2,643 in 1958; Jenne from 6,797 in 1958 to c. 10,000 in 1970 (Gallais 1967, II: 551-552) and because of our ignorance of the effects upon settlement density of the political disturbances of the latter half of the present millennium, particularly the forced resettlement policies of the nineteenth century (vide supra, Chapter 2). It may be possible in the future to develop a typology of hamlets-villages-towns, to which a range of maximum and minimum population per hectare may be applied. It appears unlikely that settlement density was as great on highland features as at floodplain tells. With respect to functional differentiation within Jenne, Gallais (1967, II: 556-558) provides some detail of the occupational divisions of the present-day population (40% "pre-urban" farmers, fishermen, and pastoralists, and 60% "urban" craftsmen, merchants, professionals, and intellectuals). It will be many years before we can estimate the functional size of Jenne-jeno to the same standard of detail, or know whether the ancient settlement was divided into "pre-urban" and "urban" parts as appears to be the case in Jenne today.

Clustering. The difficulty in estimating settlement size and population of the community is augmented by the problem of interpreting the phenomenon of site clustering. In other parts of the world, clusters have variously been

By the time of the Moroccan invasion of 1591, or shortly thereafter, the interior appears to have been balkanized by the Bambara fama, Fulani ardo, and Moroccan arma, between whom only short and unsteady peace was established, and who regularly raided and ravaged lands and villages of all ethnic groups (especially the traditional groups lacking a martial tradition). The oral traditions recall this as part of the long period during which farmers on the small mounds around Jenne often had to run to the safety of the city walls.

Again there is some reason for historiographical doubt: as one approaches the present the ethnic and political explanations become more important than the environmental. Is this a function of the quality of the sources for the more recent periods?

Phase V. Events dating from the late-sixteenth century and especially during the nineteenth century established the settlement pattern seen today in the Inland Delta. Political instability and penetration by the Bambara and Fulani continued. In the eighteenth century the region fell under nominal control of the Fama of Segou and in the early-nineteenth century the Fulani cleric Séku Amadou dramatically altered the traditional settlement pattern. He forced all nomadic Fulani to establish or join a permanent village, which had to be located on a highland landform because of the need to keep milk cows during the winter and to grow sorghum for those cows. By the beginning of French administration most villages near Jenne were inhabited by Rimaibe or mixed Fulani-Rimaibe (cf. Monteil 1903: 284). By this time many Bambara had established villages or become the major part of villages on the dunes or Light Levee, and Séku Amadou further settled Bambara prisoners within the Survey Region. It was the policy of Séku Amadou to gather all people together in larger, more-easily controlled villages; hence the modern pattern of quite large villages, very few tiny settlements, and a strong tendency towards isolation or pairing at most. There are also fewer modern settlements of greater-than ten hectares (although more as a percentage of all villages). The Tukulor continued many of the same policies during the last few decades before French administration.

Part ii

Section III

JENNE-JENO AND ITS REGION IN PERSPECTIVE

CHAPTER 7

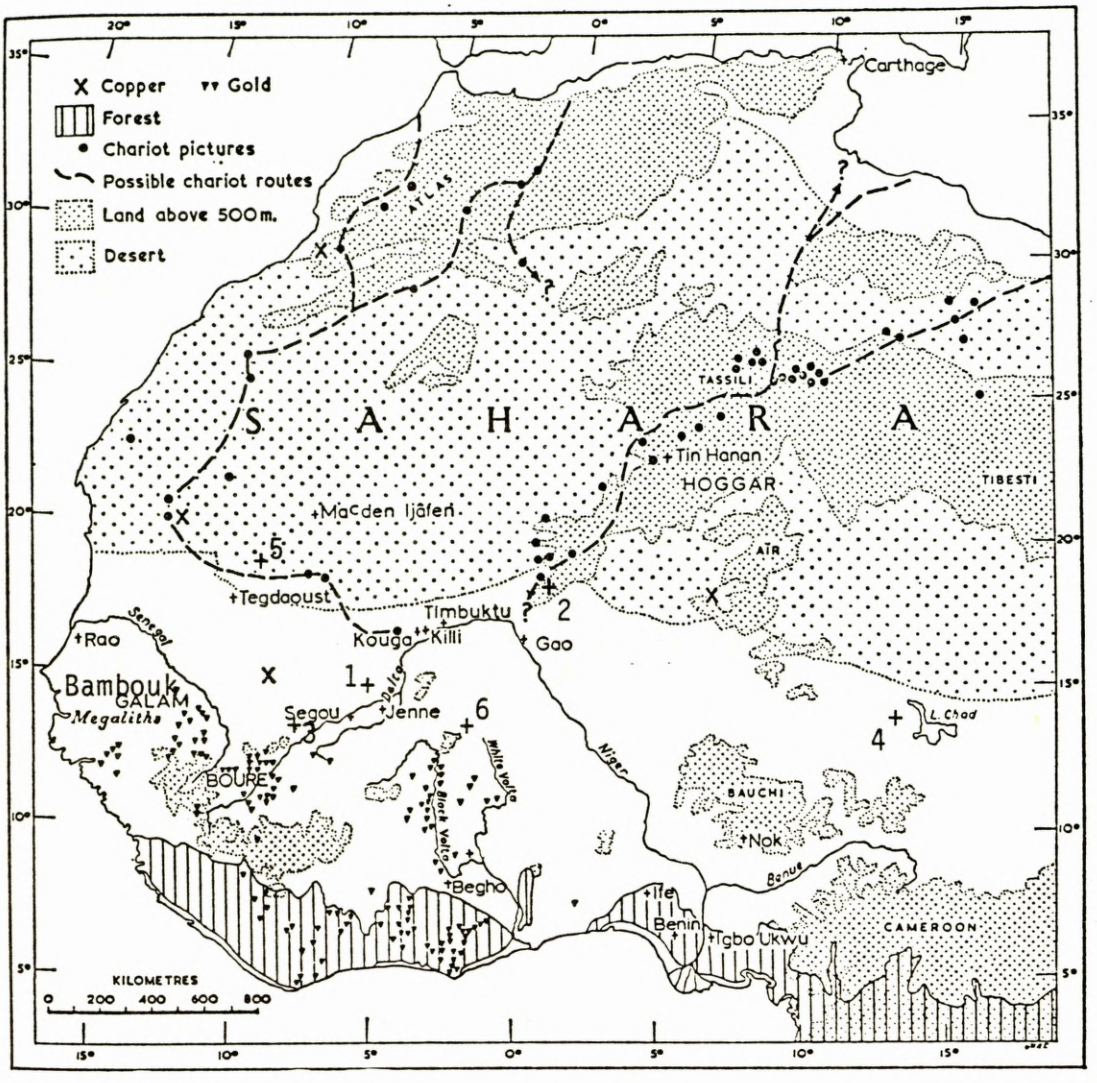
JENNE-JENO: IMPLICATIONS OF THE EXCAVATIONS AND REGIONAL SURVEY

EARLY JENNE-JENO

Origins of Jenne-jeno Culture

No material attributable to the Late Stone Age ('Neolithic') was found at any point in the excavations at Jenne-jeno. The first occupants of the site appear to have been fully iron-using and did not use flaked stone tools, nor is there any evidence for bone tools such as harpoons. In fact, flaked and polished lithic artefacts seem to be singularly absent from the western IND. Neither Szumowski (1954, 1955, 1956a, 1957a) nor Bedaux (1976b, 1977) reported encountering any lithic material in the course of their extensive reconnaissance; three months of intensive survey of an unbiased 20% sample of the permanenetly dry, upland areas within a 25-kilometre radius to the north and west of Jenne turned up not one flake. These results, particularly those from the controlled sample survey near Jenne, strongly suggest that Late Stone Age sites on upland areas are extremely rare in the western IND, if indeed they exist at all. Many of the archaeological sites in the IND appear to be quite recent (i.e., second millennium A.D.), and all available evidence points to the development of tell sites as a uniquely Iron Age phenomenon in the IND. This, of course, provides a sharp contrast with the situation documented in Bornu of the tell sites on the firki (clay plains) south of Lake Chad (Connah 1976: 327).

Why would Late Stone Age pastoralists/hunter-gatherers avoid the IND when similar environments in the Sahara were drying up after c. 2000 B.C., presumably causing movement of populations towards better-watered areas to the south? Two reasonable explanations present themselves. It is entirely possible that there was Late Stone Age occupation in the IND which was seasonally concentrated in low-lying areas during the driest months of the year (a pattern not unlike that of the Fulani pastoralists in the area today). In this case, evidence of Late Stone Age presence would be buried under a considerable amount of alluvium. Alternatively, it has been suggested, on analogy with Lake Chad, that the present IND may have been a slowly desiccating lake or high-floodwater area during the second and first millennia B.C. Nicholson (1976: 72-97) has found evidence of higher water levels in the Niger lakes during the period 1300-300 B.C., which presumably implies a more active flood regime at that time in the upstream IND region feeding the lakes.[1] Settlement within the area of the present IND may not have been possible until the waters reached approximately their present level c. 300 B.C. Given such a situation, a site like Kobadi (see Map 7.1) may be an example of the kind of Late Stone Age site that was located adjacent to the second/early-first millennium



\+ additional sites

1. Kobadi
2. Karkarichinkat
3. Kourounkorokale
4. Daima
5. Tichitt
6. Rim

MAP 7.1 Various sites mentioned in Chapter 7. (adapted from M.Posnansky, 'Aspects of early West African trade', World Archaeology 1973:151)

Inland Delta region. Mauny reports that the surface of Kobadi is "jonché d'ossements humains, d'animaux et de poissons, de fragments de poterie, et de pierres taillées...Il y fut trouvé aussi 2 harpons en os" (Mauny 1967a: 76, 78). A radiocarbon date of 713 ± 145 b.c. is available for the site (Posnansky and McIntosh 1976: 192).

Further work is required before these two possibilities can be adequately assessed, but in either case it is reasonable to think that the Early Iron Age culture at Jenne-jeno developed out of the Late Stone Age culture of sites like Kobadi. Even if it is not possible to see an in situ development from Late Stone Age to Early Iron Age in the IND, there is no reason to believe that the cultural elements of Phase I occupation at Jenne-jeno were transported from points much more distant than the northern and western periphery of the Delta. The persistent traditions among the Bozo and Nono of origins from Dia may be a memory of this movement into the Delta.

Comparisons of the material culture from Phase I at Jenne-jeno with that of other sites are difficult; the only other Iron Age sites in West Africa of comparable antiquity are in the Nok area of Nigeria almost 1500 kilometres to the southeast. The closest we can get to Jenne-jeno both chronologically and geographically in terms of well-studied sites are Rim IIIa and IIIb (A.D. 0-950), Tichitt (sequence ends c. 400 B.C.), and Karkarichinkat (ends c. 1300 B.C.). Kourounkorokalé is a Late Stone Age site with pottery, but its age is unknown. Lithic tools, both polished and flaked, are common in all of these sites, including the Iron Age levels at Rim (Wai-Ogusu 1973: 301). Apparently, settlement in the IND, which lacks any source of stone for tool manufacture, occasioned a radical shift in tool kit, since no stone tools other than grinding stones were found at Jenne-jeno. Any between-site comparisons we might wish to make, then, will focus primarily on the pottery from these sites.

There can be no doubt that the Phase I ceramics at Jenne-jeno are off-shots of a Saharan pottery tradition. Late Stone Age pottery in the southern Sahara is characterized by: simple-rimmed pots of spherical or hemispherical form (Camps-Fabrer 1966: 464), well-made paste (Camps-Fabrer 1966: 521) which was often sand-tempered, and predominance of impressed decoration over much of the surface of the pot (Camps-Fabrer 1966: 464; Lambert 1965b: 436). Although there appear to be regional and temporal preferences in the Sahara for different types of impressed decoration—twine, rocker-stamping, scored-paddle impression, comb—the salient point here is the rarity of incised or cordoned decoration in the 'Saharan Neolithic'.[2] The general homogeneity of southern Saharan Late Stone Age ceramics is strikingly illustrated by Mauny (1967).

By contrast, the Late Stone Age pottery from the savanna and forest areas in West Africa (especially that of the so-called Guinea Neolithic) differs in several major aspects from 'Saharan Neolithic' ceramics: there is a preponderence of everted and flaring rims and coarse and poorly made paste tempered with grog, as well as a tendency towards deep plastic decorative techniques such as grooving, stabbing, and relief cordons (cf., Mauny 1951c; Bessac 1952; Holas and Mauny 1953; Szumowski 1956b).

Of course, there is some degree of overlap between the pottery assemblages of the Saharan and the Guinea Neolithic (e.g., comb decoration is popular in some parts of both regions), but in general the differences between Saharan and savanna/forest Late Stone Age ceramics are substantial (cf., Mauny 1967a: 73, 74, to compare pottery from Senegal with Saharan ceramics). The majority of pots from Phase I at Jenne-jeno had simple restricted or unrestricted rims and were made from a well-prepared, sand-tempered paste. Most of these sand-tempered sherds were noticeably thinner (<8 mm) than the grog-tempered wares that predominate from Phase II on. The thinness of the sherds from a number of south Saharan sites has been commented upon by Smith (1974a: 185) and Lambert (1965b: 440-2). The main decorative motif of Phase I pottery is overall twine impression; grooving appears infrequently. These characteristics unmistakably identify the Saharan affinities of the early Jenne-jeno pottery. Again, we recall that the two earliest groups in the Jenne region, the Bozo and the Nono, both entered the IND from the northwest via Dia according to oral tradition (Monteil 1932: 29-31).

Systematic comparison of the pottery from Jenne-jeno, Karkarichinkat, Tichitt, and Kourounkorokalé (Table 7.1) demonstrates that the pottery from Phase I deposits at Jenne-jeno is most similar to that from the Goungou/Nkhal phase at Tichitt with respect to several important attributes. The significance of this is unclear at present. It might also be noted that Jenne-jeno pottery bore a strong resemblance to the ceramics from Rim, which were also characterized by a strong predominance of simple rims and twine decoration (Wai-Ogusu 1973).

TABLE 7.1
Comparison of pottery characteristics
from selected sites in West Africa

Site	Temper		Red	Simple	Undec.	Twine
	Grog	Sand	Slip	Rims	Sherds	Impres.
Phase I Jenne-jeno	yes	yes	50%	80%	20%	75%
Karkarichinkat	yes	yes	rare	70%	60%	10%
Goungou/Nkhal phase Tichitt (ends 1100 B.C.)	yes	yes	rare	90%	rare	70%
Akjinjeit - Tichitt (ends c. 400 B.C.)	yes	yes	10%?	10%	90%	10%
Kourounkorokalé	no	yes	none	50%	none	10%

Jenne-jeno and the Origin of Iron

Because the earliest radiocarbon date from Jenne-jeno is over two hundred year later than the earliest radiocarbon dates for iron smelting in the Nok region of Nigeria, the presence of iron and slag at Jenne-jeno cannot be considered to provide direct evidence of the route by which iron technology spread into West Africa (despite the claim to the contrary by Calvocoressi and David 1979: 12, 21). If, however, we have correctly assessed the Saharan affinities

of the earliest pottery at Jenne-jeno, then there is indirect evidence that knowledge of iron-smelting in the southern Sahara west of the Niger Bend must pre-date the earliest settlement at Jenne-jeno. The Munsons' iron-using Libyco-Berbers (Munson and Munson 1969: 62-3) may ultimately prove to be the agents responsible for the introduction of iron into the southwestern Sahara after the seventh century B.C., but there is nothing from Jenne-jeno which could be construed as proof that iron spread from the northwest into the area west of the Niger Bend rather than from the northeast (e.g., from the Azelick region).

More interesting than the chronology of iron metallurgy at Jenne-jeno is the evidence that the iron at the site must have been obtained from outside the IND, presumably by trade. To the best of our knowledge, there are no sources of iron ore in the IND suitable for smelting. Although 'limonite nodules' are abundant on the alluvium, samples collected from the floodplain and from Jenne-jeno proved to be not ferric oxide nodules but concretions of quartz stained by ferric oxides. P. Jacobberger, who examined these nodules petrographically, concluded that they were completely unsuitable as a source of iron ore (P. Jacobberger, pers. comm., 1979). In the study of the geology and geomorphology of the IND, we noted no potentially ferruginous outcrops or lateritic crusts within the Delta proper. We can only conclude that the source of the iron at Jenne-jeno was indeed located outside the Inland Delta. The considerable amount of slag on the surface of Jenne-jeno and in the deposits is therefore puzzling. Two possibilities come to mind: either iron ore was being imported into the IND where it was smelted and forged, or bloomery iron with some slag still adhering was imported and subsequently forged at Jenne-jeno. The latter possibility seems the more reasonable; transport costs are reduced substantially by removing most of the weight of useless silicates from the ore at the source area.

Before European iron was introduced into Jenne in the 20th century, Monteil reports that the city obtained the vital metal from the Bénédougou region near San. From Monteil's account (1903: 193) it appears that Jenne imported bloomery iron that had been preliminarily forged into plaques or bars each weighing approximately one kilogram; from these, local blacksmiths fashioned required items, such as nails. In 1830, Caillié noted that Jenne's iron was smelted in Béré (in the Bénédougou), where there was a great deal of ferruginous stone on the surface of the soil. Bloomery iron from Béré was exchanged in Jenne for salt (Caillié 1830, Vol. I: 421). Although it is not possible to state with certainty whether the iron at Jenne-jeno was obtained from the same source and in the same manner observed by Monteil and Caillié at Jenne, we can at least say that the Bénédougou was (and is) the nearest source of abundant iron ore to Jenne. It is therefore highly likely that the Bénédougou/Jenne iron trade is of considerable antiquity, perhaps dating back to the founding of Jenne-jeno.[3] (Bénédougou = Bindugu on Map 3.2, p. 54 in Part i).

Origins of Agriculture and Development of the Subsistence Economy

It was mentioned in Chapter 1 of Part i that various authors have argued that the cultivation in the IND of certain Sudanic cereals, such as fonio (Digitaria exilis), bulrush millet (Pennisetum typhoideum), and African rice

(Oryza glaberrima), is of considerable antiquity. Portères (1976) has identified the IND as the area where African rice was indigenously domesticated from wild Oryza breviligulata (=O. barthii). Most researchers agree that of all the Sudanic cereal crops, O. glaberrima provides the strongest evidence for indigenous domestication in the Inland Delta. Indeed, rice domestication in the IND is widely accepted in the literature (Clark 1976: 81; Davies 1967: 149; Shaw 1977a: 102). Although a convincing chronology for this process is lacking, it is probably fair to say that most researchers would fully expect to find semi-sedentary Late Stone Age populations in the Inland Delta experimenting with rice cultivation by the late third millennium or early second millennium B.C. However, the first direct archaeological evidence relevant to this problem, resulting from the 1977 research, indicates that permanent settlement in the western IND may not antedate the Iron Age, and that rice cultivation may not have been practised in the Delta until late in the first millennium B.C.

As we have seen, a major point to emerge from the excavations was the absence of Late Stone Age material; the first settlers at Jenne-jeno arrived by c. 200 B.C. with full knowledge of iron technology. Unfortunately, we lack evidence of plant exploitation during the earliest phase of occupation at Jenne-jeno. It is clear, however, that the Phase I economy was heavily reliant on aquatic and floodplain resources including reedbuck, catfish, Nile perch, tortoise, and crocodile, as well as on a small bovine likely to be Bos taurus. By the first century A.D., at the beginning of Phase II, domestic rice was present in quantity. Phase I economic elements continue in Phase II, and the highly productive rice/fish/cattle subsistence complex which persists through Phases III and IV and indeed into the present at Jenne is almost certainly established by A.D. 100 at Jenne-jeno.

The absence of domesticated bulrush or fonio millets at Jenne-jeno was a surprise. The well-documented presence of domestic bulrush millet at Tichitt in southwest Mauritania by c. 900 B.C. (Munson 1976) nourished an expectation that cultivation of Pennisetum was of equal if not greater antiquity in the Inland Niger Delta. Results of our systematic regional survey covering a 1,100 square-kilometre area to the north and west of Jenne-jeno suggest that millet cultivation was a late introduction into the western IND. Based on surface collections of pottery which permitted archaeological sites mapped during survey to be tied into the ceramic chronology devised for Jenne-jeno, it appears that all settlement sites situated on the sandy upland soils favoured by millet cultivators today post-date Phase IV. The currently heavy occupation of these light soils can, in most cases, be attributed to the historically-documented penetration of the area by Bambara millet farmers. This migration may have begun as early as the thirteenth century A.D., but reached its maximum impact from A.D. 1500 to 1800 (Delafosse 1912: 283-289; al-Sa'di 1900: 171-172). The overwhelming predominance of archaeological sites earlier than Phase IV on low floodplain soils suggests that millet cultivation was not introduced into the western Delta until the late first millennium or early second millennium A.D.

Summary

Various widely-held ideas concerning the antiquity of permanent settlement and cereal domestication in the Inland Niger Delta require substantial modification in the light of the 1977 research in the Jenne area. Based on the results of excavation and extensive, systematic regional survey, it does not appear possible, at this time, to see an *in situ* development in the western Inland Delta from Late Stone Age to Iron Age. The Jenne-jeno excavation data suggest that permanent settlement, resulting in *tell* formation, was initiated by fully iron-using peoples who entered the western delta in the last half of the first millennium B.C. The Saharan affinities of the earliest pottery point to an origin to the north or northwest.

The similarity of the Phase I economy at Jenne-jeno to that of earlier sites along the southern Saharan fringe indicates that penetration into the delta was probably part of the general southward movement of Saharan pastoralist/collectors which began in response to increasing desiccation *c.* 2000 B.C. (Clark 1976: 80). Between 2000-1000 B.C. southern Saharan sites like Tichitt and Karkarichinkat were established on seasonal lakes and stream courses; their economy was heavily reliant on cattle herding and seasonal aquatic resources, especially fish (Munson 1976; Smith 1974a). It appears that these herding/fishing/collecting groups responded to the disappearance of aquatic resources that accompanied Saharan desiccation in two ways: by increasing reliance upon cereal cultivation (domestic *Pennisetum* at Tichitt); or by southward migration. Settlement during the first millennium B.C. on seasonally inundated floodplains to the south permitted continuation of the older Saharan herding and fishing way of life. Daima and Jenne-jeno are likely examples of this pattern. Domestic cereals appear to have been adopted at Daima, Jenne-jeno, and Tichitt at widely different times, however. More intriguing yet is the current evidence that entirely different cereal crops were adopted at these three sites. Domesticated bulrush millet appears at Tichitt between 1000-900 B.C.; at Daima, there is no sign of cereal cultivation before the fifth or sixth centuries A.D. when sorghum appears to have been introduced (Connah 1976). African rice is present at Jenne-jeno from the first century A.D., and analysis of prehistoric and historic settlement patterns in the western Inland Delta indicates that millets and sorghums may not have been introduced until the late first millennium or early second millennium A.D. Ultimately, our ability to understand the process of plant domestication in West Africa must take into account the factor of significant regional differences both in the chronology of cultivation and in the actual crops cultivated. Traditional "advancing front" models for the spread of farming in West Africa, in which domesticated species or knowledge of them are thought to move outward like ripples in water from an area of origin, are seen increasingly to be counterproductive.

Unfortunately, we do not know whether rice cultivation was practised by the earliest occupants of Jenne-jeno. Although it is probable that domesticated rice was introduced from outside the Delta, either at the beginning of Phase I or slightly later, the possibility that local manipulation of wild rice was taking place during Phase I over a wide area of the Inland Delta—including Jenne-jeno—should not be rejected out of hand. Whatever the ultimate origins of *Oryza glaberrima* in the western Inland Delta, it is clear that rice cultivation

was well established by the first century A.D. as part of a remarkably stable and enduring subsistence complex, which remains dominant in the Delta today.

THE URBAN PROCESS AT JENNE-JENO

The Expansion of Jenne-jeno

The archaeological evidence for the growth of Jenne-jeno is far from complete, yet a plausible reconstruction of the site's development is possible using the data from the 1977 excavations. This evidence strongly suggests that Jenne-jeno began to expand during Phase I. Deposits dating to this early phase were found only in M1 and M2, located 110 metres apart. Phase II deposits were present in all three excavation units, separated by a maximum distance of 440 metres. This may be considered to be the minimum linear extent of the site at that time. If it is reasonable to expect that the Phase II site was at least three-quarters as wide as it was long (i.e., measuring at least 300 x 400 metres) then the minimum areal extent of Jenne-jeno by A.D. 200 (mid-Phase II) would have been 120,000 square metres. By analogy with presently occupied sites on artificial mounds in the IND, at which settlement tends to be very dense, a site of this size could potentially support a population of up to 4,000. Of course, this extremely tentative estimate is based on the assumptions that settlement was dense in Phase II and that the deposits in the three excavations units were part of a single mound during Phase II and not two different mounds separated by a short stretch of floodplain. Both these assumptions need to be investigated in the course of the next excavation season. Also to be clarified by future research is the rate of physical expansion of Jenne-jeno in Phase I and the areal extent of the mound at the beginning of Phase II. Based on present evidence, however, it seems fairly safe to suggest that Jenne-jeno was growing in size throughout Phase I and was a site of considerable dimensions, possibly exceeding 10-12 hectares, by early Phase II.

There are indications that occupation of Jenne-jeno became incraasingly intensive in Phase III (A.D. 400-900). An increasing number of wall stumps is visible in section, and the stratigraphy of Phase III deposits becomes noticeably more complex. In M1, wall stumps are associated with fairly deep deposits, suggesting that occupation of a house could span an appreciable time period, perhaps several centuries. The appearance of crowded cemeteries in Phase III may be further evidence of population growth and intensified site occupation. All four inhumation burials and six of the nine urn burials in JF1 appear to have been interred during Phase III, based on the ceramic material contained in the cemetery deposits. Owing to the inevitably disturbed nature of the soils in a cemetery area, however, a chronology for the burials cannot be definitely determined in the absence of numerous radiocarbon dates. Nevertheless, all available evidence indicates that the busiest period of cemetery use at JF1 was Phase III.

Jenne-jeno probably reached its greatest extent in late Phase III/ early Phase IV. Thereafter, the site slowly began to decline. Phase IV deposits are absent at JF1, which may mean that the southeastern periphery of the site was no longer undergoing active depositon after c. A.D. 900. On the other hand, it has been pointed out that Phase IV deposits may have been eroded

from JF1, which lies in a downslope area. More convincing evidence for the gradual decline and abandonment of Jenne-jeno comes from the sequence of deposits at M1 and M2. Based on the ceramic chronology, deposition in the area of M2 seems to have ceased sometime substantially prior to the end of deposition in M1. We interpret this evidence to mean that the abandonment of Jenne-jeno, which was complete by the mid-fifteenth century, probably occurred gradually. Upper excavation levels certainly show no sign of burning or any other evidence for a cataclysmic end to occupation.

At its apogee, perhaps from A.D. 750-1150, Jenne-jeno covered 33 hectares. To this can probably be added the 9-hectare expanse of the mound of Hambarketolo, which lies immediately adjacent to Jenne-jeno to the north, and which is actually connected to Jenne-jeno by an earthen dike. Pottery from the surface of Hambarketolo indicates that it too was abandoned during Phase IV. Deposits are shallower at Hambarketolo than at Jenne-jeno, achieving a maximum depth of approximately two metres. This may mean that Hambarketolo was founded later than Jenne-jeno and functioned as part of the city at the time of its fluorescence in late Phase III/ early Phase IV.

The causes of Jenne-jeno and Hambarketolo's decline and ultimate abandonment are unknown. As meagre as the data for the chronology of this process are, it nevertheless appears from the archaeological evidence that the beginnings of site abandonment coincide closely with the thirteenth century date for Jenne's islamisation reported by al-Sa'di. It is very possible that a new, muslim Jenne was founded on a new site unpolluted by pagan practices shortly after the king of Jenne (-jeno) was converted to Islam. If, as we have every reason to believe from the historical records, commercial control became vested in the hands of native, muslim merchants, the new Jenne would soon replace pagan Jenne-jeno as the hub of economic activity. Farmers, fishers, and craftsmen, who undoubtedly comprised the majority of Jenne-jeno's population and who probably remained pagan (if Malfante's fifteenth century report is correct—see Part i, Chapter 3), would have been attracted to Jenne because of her growing market for their produce. Our hypothetical reconstruction of the decline of Jenne-jeno sees economic incentives at the new, muslim market centre of Jenne as a primary cause of Jenne-jeno's abandonment. Of course, other possibilities, such as the population pressure theory cited so frequently by our informants in Jenne, deserve consideration, although I find it hard to understand how population pressure could lead to the abandonment of a large site in favour of another site only three kilometres away; such an explanation seems counter-intuitive. Ultimately, a satisfactory reconstruction must account for the gradual decline of Jenne-jeno, presumably to the profit of Jenne, since the population of an urban site over forty hectares in area does not simply vanish into the hinterland.

The Development of Jenne-jeno's Rural Hinterland

It is entirely possible that the early expansion of Jenne-jeno was complemented by a proliferation of settlements in the upper Inland Niger Delta. Most sites on the floodplain appear to have had a history of occupation of several centuries at least, and one might expect the sites on the deep and middle floodplain soils and close to standing water to have been founded during the last centuries B.C. or first centuries A.D. It is interesting that there

is little ancient occupation along the lower Finakie, where there is abundant standing water, but the highest floodplain soils.

It may have been the case that initially a single site was founded, which then served as the focus, or germ, of a site-cluster. Satellite sites may have begun as rubbish tips, but more likely represent economic or functional divisions or ethnic symbiosis. Small satellite sites may have been used seasonally (e.g., 157-2, 155-8, which are high-water Bozo settlements) or may simply be a recent artefact of the instability of the latter half of the second millennium A.D.

By early Phase III, one should search for the origin of a distinctive Jenne-complex. The concentration of several very large settlements in the north-eastern Pondori may be an urban extension of the principles of clustering of rural sites, and these principles may be recalled in the oral traditions, e.g., ethnic (Bozo at Kaniana, Bobo at Kanafa, Nono at Jenne and Jenne-jeno) or functional (smithing and potting at Kaniana, commercial at Jenne, commercial and agricultural at Jenne-jeno). The present town of Jenne is built atop a very high mound and several other large sites (Kanafa, and Jenne-jeno) are believed locally to have been occupied 500 to 400 years before the foundation of Jenne. Is the fact that so many Bozo (more than 1,000) are settled permanently in Jenne and that Bozo are said to have been the original members of the craft corporations (smiths, potters, and masons) an indirect argument for a great antiquity of these urban institutions?

It appears that most or all of the large sites of the Jenne-complex were occupied during Phase III and partly or wholly abandoned in Phase IV. It is also highly probable that the majority of the sites in the hinterland of Jenne were also occupied during the second half of the first millennium and early centuries of the second millennium A.D. The numbers of settled sites dropped off rather rapidly thereafter. al-Sa'di's report that the territory of Jenne once had 7,077 villages and that messages could be transmitted by crying out from village to village, so close were they to one another, may be a memory of this period.

The dense population and widespread similarity of artefacts of this period argues for a certain degree of administrative control, providing a stable political environment for the exchange of goods and services. A growth of specialized sub-populations, social ranking, and local administrative hierarchy may be reflected in the size divisions of the ancient settlement hierarchy and it is interesting that the Index of Complexity, crude as it is, does increase as a function of site size. It may be that the pattern of many very small sites (of 0.05 to 0.8 hectares) and many large sites is a function of political control over a well-integrated economic network by which competition (which produces more sites of average size) is reduced. However, it will be a long time before one will be certain enough of the contemporaneity of sites to apply the 'rank-size' measure developed in part to measure the effect of political control (Johnson 1977: 495-501). The successful symbiosis of the original ethnic groups and the weakness of the early Fulani penetration of the region may be expressions of long-established administrative authority before the alien imperial force of Mali and Songhay stripped away direct political control over a larger hinterland.

The late surge of concentration of sites around Jenne may be attributable to the increase in instability during the latter part of the second millennium A.D. This clustering would be due less to consolidation of the population by force (as happened during the nineteenth century) than to a gradual movement towards towns with better defences.

The sources emphasize the instability of the region and recall a more peaceful past. However, the Massina and Jenne were quite wealthy throughout the nineteenth century and it is entirely likely that some degree of political and climatic unpredictability was a feature of the Inland Niger Delta even at its heyday.

It is clear that the population of the region has declined greatly. One should look to a complex and composite reason for this decline, one which considers the overall climatic deterioration, decline of specific parts of the environment (e.g., recent strangulation of distributaries), diseases penetrating the long-distance trade networks or long-established, but reawakened by the changing climate, penetration of the martial Bambara, Fulani and Tukulor, the effects of balkanization of the region by the fama, ardo and arma, and the wrath of Islamic reformers. Most differences in patterns of landuse between the ancient cumulative pattern and the modern can be attributed to recent centuries. Modern patterns will be of little help in attempts to refine our understanding of human settlement in the hinterland of Jenne during the past two and a half millennia.

In summary, the survey results accord well with the excavation results: both indicate that Jenne-jeno and her hinterland were developing rapidly during Phase III (c. A.D. 400-900). Site density reached a maximum in the hinterland in late Phase III/early Phase V , at approximately the same time that Jenne-jeno achieved her maximum areal extent. Jenne-jeno apparently began to decline, and was ultimately abandoned, as part of a general population reorganization in the western IND, archaeologically manifested by abandonment of large numbers of sites. The reasons for this population shift are unknown.

Implications of Jenne-jeno for First Millennium Trade

The 1977 excavations have demonstrated that Jenne-jeno existed as early as 250 B.C., and that the site was rapidly developing into a town measuring, by A.D. 400, a half-kilometre or more along one axis. By A.D. 900/1000, it appears likely that Jenne-jeno and neighbouring Hambarketolo formed an urban unit covering almost 40 hectares. We are, of course, vitally interested to discern what the causes of this early and quite rapid growth might have been. Given the pre-eminent role of Jenne in the commercial networks of the second millennium A.D., we may fairly hypothesize that trade was a factor, though not necessarily the only factor, in the development of Jenne-jeno in the first millennium A.D. Situated in an alluvial plain devoid of stone and iron ore, at the interface of two major ecotopes (dry savanna and Sahel), Jenne-jeno is a natural candidate for the early growth of interregional exchange. Indeed, the available archaeological evidence strongly indicates Jenne-jeno's involvement in trade from Phase I onwards. The significance of iron and slag throughout the deposits has already been discussed. Suffice it to re-iterate here that iron ore or bloomery iron was probably reaching Jenne-jeno from the closest abundant source, which is the Bénédougou region to the southwest. Also present in the earliest Phase I levels were stone beads whose source area, although unknown, must lie outside the IND.

Evidence that the exchange networks within which Jenne-jeno functioned had expanded by the fifth century A.D. is provided by copper ornaments in the earliest Phase III deposits. The three closest known sources of copper are in the Sahara: Akjoujt, Nioro, Air (Mauny 1961: 307). In late Phase IV, contacts with the Islamic world are suggested by the presence of spindle whorls. The stratified evidence at Jenne-jeno of spindle whorls only in the uppermost deposits supports Mauny's contention (1961: 59) that the spinning of cloth was introduced into the Western Sudan by Muslims sometime after A.D. 800. In an extremely fragmentary way, then, the archaeological evidence from Jenne-jeno does document the development of trade networks involving Jenne-jeno: from inter-regional Sahel/savanna exchange in Phase I to external trade with the Islamic world by late Phase IV.

Limited though the present archaeological data are, they nevertheless have profound implications for our understanding of trade in the Western Sudan during the first millennium A.D. Historians have, in general, speculated very little on the existence or nature of pre-Arab trade in West Africa. The few who have attempted to comment on this felt either that pre-Arab trade must have been almost exclusively local (i.e., restricted to markets with a radius of less than 20 kilometres—Mauny 1961: 356) or that it "probably" included long-distance trade in salt or copper (Devisse 1972: 51, 361). Lack of evidence precluded further commentary. The presence of iron at Jenne-jeno provides the first direct archaeological evidence that, by 250 B.C., trade networks in the upper IND were almost certainly interregional in character. The most likely source of Jenne-jeno's iron is located over 50 kilometres away in the Bénédougou region. Hopkins (1973: 53) has argued that the presence of institutionalized trade between areas over ten kilometres distant had implications for the organizational complexity of the groups involved:

> The classification adapted here is a simple one based on distinction between local and long-distance trade. Local trade refers to transactions which took place within a radius of up to about ten miles of the area of production. This was the range that could be covered in one day by foot or by donkey, while still allowing time to exchange products and return home. Beyond this radius it was necessary to make arrangments for overnight stops, to reallocate work in the household, and sometimes to make use of professional carriers and commercial intermediaries. ...This distinction between local and long-distance commerce becomes useful because it draws attention to differences in degrees of specialization, in types of commercial institution, in the composition of goods traded, and in the nature of consumer demand.

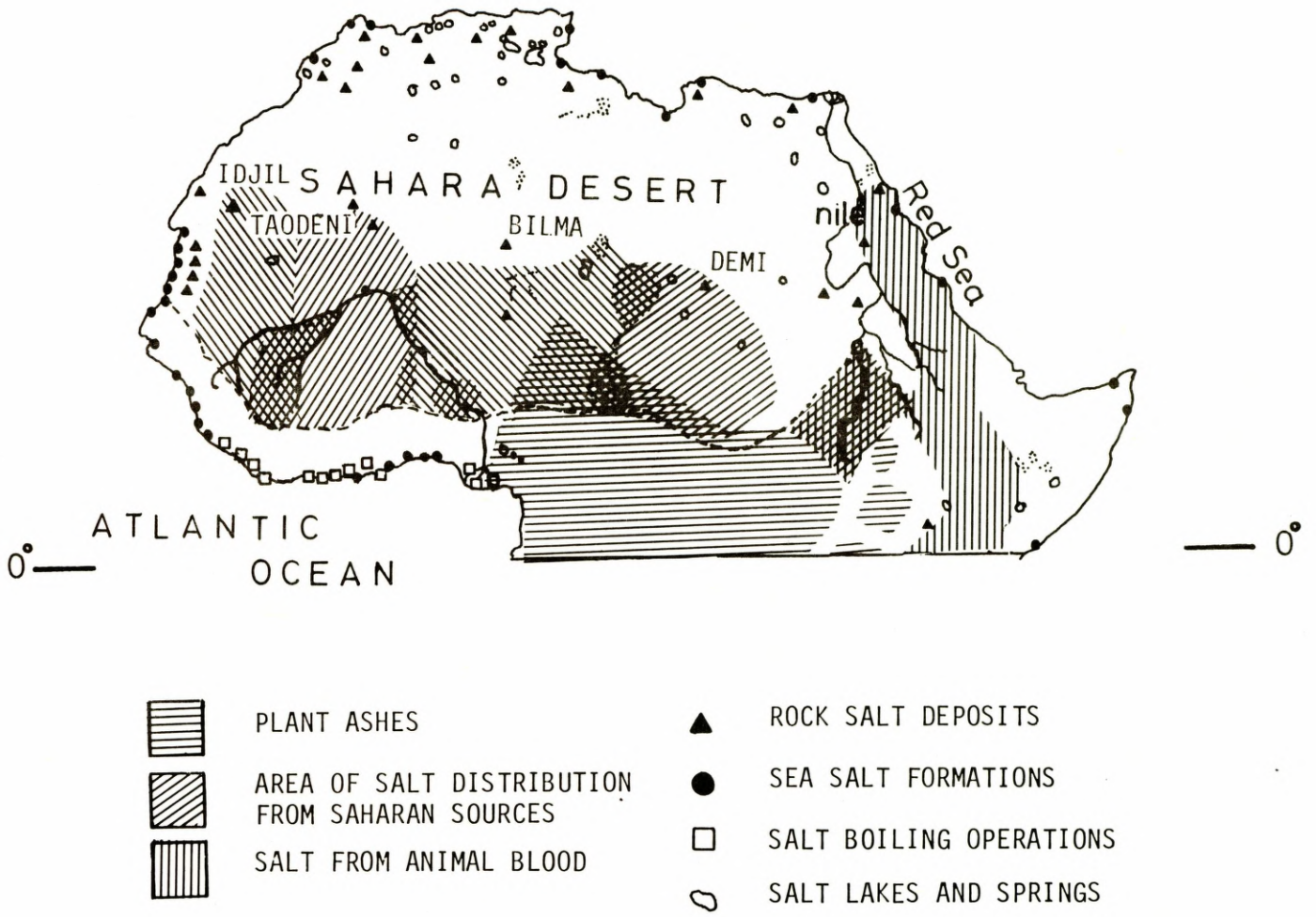
Given the ease of riverine transport within the IND, it is reasonable to suppose that exchange networks with the north also developed very early at Jenne-jeno, although the earliest direct evidence of northern contact occurs at the beginning of Phase III (c. A.D. 400) . The copper found in M1, Level 20 is most likely to have originated in the Sahara, but the precise source is not known. It is relevant to note, however, that pre-Arab copper activity has been documented at Marandet (Niger) where dates of a.d. 550 $\pm$ 100 and a.d. 640 $\pm$ 100 were obtained on charcoal from refuse heaps containing over 30,000 crucibles (Posnansky and McIntosh 1976: 183). We suggest that this

evidence strongly supports Devisse's intuition that long distance trade for Saharan copper extends well back into the first millennium A.D. We would further suggest that if the Phase III copper at Jenne-jeno in fact originated in the Air, the most direct Air-Jenne-jeno route would be overland from Air to the Niger River and then upstream to the IND.

Other Saharan commodities carried in this early trade can only be guessed at: salt is a major possibility, given the historically-documented demand in the Sudan for salt and copper from the Sahara.[5] Salt is a requirement of the human body and must be taken in mineral form in tropical parts of the world, such as savanna and forest regions of Africa, where meat is scarce (Bloch 1963: 89). Although forest areas in West Africa probably obtained salt from salt pans on the coast in the first millennium A.D. (see Map 7.2), the savanna regions likely depended on salt mined from the handful of major rock salt deposits in the Sahara. Unfortunately, salt trade is difficult to document archaeologically. At this point, we can only build a plausible case, based on highly circumstantial evidence, that indigenous long-distance trade in Saharan salt and copper was active by the fifth century A.D.

If we have correctly assessed the importance of salt in the early first millennium trade, then the development of the navigable Niger as a major north-south transport axis reasonably dates to at least that period. The logic is simple: overland transport costs for an extremely bulky, heavy commodity like salt become prohibitive over long distances, especially when pack animals must be replaced by human head-porters in tse-tse infested savanna regions (Hopkins 1973: 72). Hundreds of miles of navigable waters on the Niger and Bani rivers permit cost-efficient transport between Sahara and savanna. We suggest that Jenne-jeno's development into an urban centre in the late first millennium A.D. was a function of the increasing importance of the IND to riverine trade during that period. Important not only for its seasonal navigability, the IND was crucial to the Niger trade because its rich fishing grounds and agricultural hinterland were capable of producing dried fish and rice, among other staples, for export to both Saharan and savanna regions. Jenne-jeno's location at the southwestern extreme of the navigable and agriculturally productive IND indicates that the town developed as a point of exchange where Saharan commodities like copper and salt could be traded for dried fish and rice produced in the IND, and where savanna commodities, including iron from Bénédougou, could be efficiently obtained, with a minimum of overland travel, in exchange for salt, copper, rice, fish and other staples. Gold may also have been one of the savanna commodities moving along the exchange networks at this time (Mauny 1961: 399).

We have already mentioned that this tentative reconstruction for Jenne-jeno's role within interregional and long-distance trade networks in the first millennium A.D. is founded on an uneasy mixture of direct archaeological data and strong circumstntntial evidence. It nevertheless provides a badly-needed alternative to existing "external stimulus" models for the development of trade and urbanism in the Western Sudan. Most historians of the Western Sudan assume that first millennium economic and political developments south of the Saharan were stimulated by trans-Saharan trade and were therefore concentrated in the Sahel zone where the impact of this trade was most directly felt. Levtzion is an active proponent of this point of view:



MAP 7.2 Salt sources in pre-colonial Africa (M.R.Bloch, 'The Social Influence of Salt', Scientific American 1963: redrawn from p.94)

> The growth of the trans-Saharan trade during the centuries preceding the Arab conquest of the Maghrib was important in stimulating political reorganization in the Sahel (Levtzion 1973: 9)[6]
>
> Sahil is the Arabic word for 'shore' which is well-understood if the desert is compared to a sea of sand, and the camel to a ship. Hence, the towns which developed in the Sahel-Takrur, Ghana, and Gao—may be regarded as ports. These towns became both commercial entrepots and political centres. Those who held authority in these strategic centres endeavoured to extend it in order to achieve effective control over the trade. Thus trade stimulated a higher level of political organization, while the emergence of extensive states accorded more security to trade. Political developments in the Western Sudan, throughout its history, are related to changing patterns of intercontinental and trans-Saharan trade routes (Levtzion 1973: 10).

The two components of the "external stimulus" model, which is very pervasive in the literature, are: the stimulus to economic and political developments in sub-Saharan West Africa came from outside the sub-continent; and the 'axis of change' along which these stimuli moved was basically north-south across the Sahara. Most historians have believed, like Levtzion, that trans-Saharan trade was the agent of change, although Delafosse, who believed that 'Judeo-Syrians' migrated across the Sahara and founded Ghana, was no less a proponent of the "external stimulus " model. A logical corollary of this model is that political and economic development in the IND was not possible until Soninke fleeing from the Sahel after the fall of Ghana in c. 1240 "carried the political heritage of Ghana" into the middle Niger area and "radiated an urban ethos" (Levtzion 1972: 3). Migration of these populations into the upper IND, plus development of commercial traffic between Jenne and Timbuktu after the political unification of the entire IND under Mali's hegemony, are assumed to have been the major causes of Jenne's growth. The archaeological evidence for Jenne-jeno contradicts the "external stimulus" model; Jenne-jeno is too big, too early, and too far south.

By contrast, the reconstruction proposed in this paper suggests that the key to political and economic development in the Western Sudan lies in the growth of increasingly complex indigenous trade networks[7] throughout the first millennium A.D. Furthermore, it suggests that the development of the navigable Niger River and IND as a major transport axis between Sahara and savanna occurred at this time. If this is correct, then we would expect the southern Saharan trade routes to be oriented east-west, leading to and from access points along the Niger Bend. The earliest historical information on the Western Sudan accords well with this reconstruction.

The very earliest source, al-Fazari (A.D. 788) mentions that Ghana, the "land of gold" measured 1000 by 80 parasanqes (al-Fazari, in Cuoq 1975: 42), which Lewicki (1961: 517-8) believes should be translated as 2000 by 160 kilometres. If al-Fazari's information is accurate, Ghana embraced, at the end of the eighth century, a narrow band along the southern Sahara/Sahel margin stretching from west of modern Senegal to west of the Chad basin. A likely reason for such an unusually-shaped territory might be Ghana's control

of the east-west trade in the southern Sahara. The fact that these routes led to the Niger is emphasized by the evidence for the very early emergence of Gao as a prominent commercial centre on the Niger Bend. Gao developed trade relationships with the Rustemid imamate of Tahert in the eighth and ninth centuries (Lewicki 1961: 524; Levtzion 1973: 27). By the early ninth century Gao's fame was such that the Arab astronomer, al-Khuwarizmi, identified it as one of two known sites in the Western Sudan (the other was Ghana) (al-Khuwarizmi, in Cuoq 1975: 44). We do not know if Gao was at this time an independent kingdom, but there can be no doubt about its political stature in 872, when Ya-qubi wrote:

> Then there is the kingdom of Kawkaw (Gao), which is the greatest of the realms of the Sudan, the most important and powerful. All other kingdoms obey its king... Under it there are a number of kingdoms, the rulers of which pay allegience to the king of Kawkaw, and acknowledge his sovereignty, although they are kings themselves in their own lands (quoted in Levtzion 1973: 15).

Gao's extraordinary power and influence at this time was undoubtedly a function of her critical position along two major long-distance trade routes: one leading northeast via Tademekka to the Ibadite centres of Wargla and Zawila, the other stretching east-west between Egypt and Ghana (see Map 3.1, p. 42, in Part i).

The northeastern route was developed by Ibadite sectarians who settled during the late eighth century in Tahert and Zawila, among other Maghrebian towns (Levtzion 1978: 641). A principal commodity carried along the northeastern route was black slaves; Zawila was the North African centre for this trade (Levtzion 1978: 638). Successive dynasties in Ifriqiya created large corps of black slaves ('abid), which they used as household troops, standing army, and domestic servants (Oliver and Fagan 1976: 48). Clearly, the trade was considerable. We know little else about the commodities carried along the northeastern routes from Gao. Possibly, gold moved along the Niger to Gao and thence to North Africa. Levtzion (1973: 127) has pointed out that the 40,000 dinars paid by the Aghlabids to the Abbasid treasury in A.D. 800 must have been Sudanese gold. Devisse (1972: 54) assumes that the gold passed through Gao because, he argues, the major access route from North Africa to the Sudan in the ninth century was the one via Tademekka and Gao. The later, and far better-known, western routes (via Sijilmasa and Awdaghust) were still in a state of exploration (Devisse 1972: 51; Triaud 1973: 59). The establishment of Tademekka along the Gao-Wargla/Zawila route had taken place by the end of the ninth century, if not a good deal earlier (Lewicki 1961: 534); by the mid-eleventh century, the entrepot is described as better built than either Ghana or Gao (al-Bakri, in Cuoq 1975: 107). Gao itself was described by al-Muhallabi in A.D. 990 as composed of two towns on either side of the river: one a commercial centre where merchants from all countries gather, the other the residence of the king (reported by Yakut, in Cuoq 1975: 77). The evidence for large, settled populations at Gao and Tademekka in the ninth century is intriguing; both are situated in the Sahara and presumably could not produce enough locally to sustain such a population. Certainly, al-Bakri reported that the Berbers of Tademekka existed on milk, flesh, and cereals imported from the Sudan (al-Bakri, in Cuoq 1975: 107). We suggest that the required staples for both towns may have been exported from the IND along the Niger River to Gao. It is by no

means improbable that Jenne-jeno's agricultural hinterland provioned Gao and Tademekka just as Jenne provided staples for Timbuktu several hundred years later.

The east-west route connecting Gao to Egypt and Ghana developed as early as, if not earlier than, the northeastern route. It was well-established by the second half of the ninth century, when Ya'qubi states that one travelled from Egypt to Ghana via Marandet and Kawkaw (Gao) (Ya'qubi, in Cuoq 1975: 49). Ibn al-Faqih mentions the same route in A.D. 903 (Ibn al-Faqih, in Cuoq 1975: 54) although he may be echoing Ya-qubi's information. It is interesting to note that the three sites along this route, Gao, Marandet, and Ghana, existed in pre-Arab times. We have already presented the evidence suggesting that these sites were actively involved in indigenous trade networks linking the southern Sahara with the Niger River. We would take the analysis one step further and argue that the rapid establishment and expansion of Arab trade in the Western Sudan was possible because it keyed into an already-extant system of indigenous sub-Saharan trade networks. According to this model, new commodities like glass and slaves began to move through the southern Sahara and the savanna largely along the same routes as the original core commodities such as salt, copper, staples, and possibly gold. Previously anomalous archaeological finds, like the glass beads and sophisticated bronzes at Igbo Ukwu (Shaw 1970, 1977b), make a great deal more sense in the context of this reconstruction. Many scholars initially rejected the four ninth-century radiocarbon dates from the site, arguing that links between the Islamic world and the Nigerian forest fringe could not have been established by that early date (Lawal 1973, Northrop 1972; Posnansky 1973; but cp., Shaw 1975). The evidence for Arab trade to the Sahel (Gao) by the late eighth century is undisputed, however. It remained only to explain how Mediterranean goods could have gone from the Sahel into the forest without allowing for a slow evolution of trade routes southwards from the Sahel as a result of Arab stimulation of the economy. Other Nigerian developments, such as early Ife and Old Oyo (Shaw 1973; 1977c) may also prove to be more readily understandable in the context of the indigenous trade model proposed here.

Summary

Based on archaeological data (largely from Jenne-jeno) and historical documentation, we have argued that the development of the indigenous economy in the Western Sudan has not received proper appreciation in the literature. The early emergence of urb anism in the IND and political centralization in the Sahel (i.e., Ghana and Gao) must not necessarily be assumed to be the result of Mediterranean contact with the Western Sudan; the development of indigenous, long-distance trade by the mid-first millennium A.D. may be cited equally persuasively as a factor. The utilization of the Niger River and the IND as a major axis for trade between the southern Sahara and the savanna is argued to be a prominent reason for the early evolution of Jenne-jeno. The very early growth of Gao, linking the desert and the river at a strategic access point on the Niger Bend, is seen as further evidence of first millennium trade along the Niger. Also important at this time were east-west routes along the southern Sahara which included the pre-Arab centres of Ghana and Marandet. It is suggested that the existence of these indigenous trade routes enormously facilitated the development of Arab trade in West

Africa: Arab commerce was essentially superimposed on an indigenous infra-structure. This reconstruction clarifies how large quantities of Mediterranean goods were apparently able to penetrate as far south as the forest less than a century after the establishment of Ibadite commercial towns in North Africa. Gao's explosive growth into the seat of the most powerful empire in the Western Sudan by the late ninth century was largely due to her control of lucrative trade routes to both North Africa and Egypt. We have argued that the actual physical expansion of Gao into an urban centre depended on securing a reliable supply of cereals and other staples from further south. Both Gao and Tademekka may have been provisioned by the IND. It is quite possible that Jenne-jeno's relation to Gao and Tademekka from at least the eighth to eleventh centuries was very similar to the relation of Jenne to Timbuktu and Walata from the fourteenth to nineteenth centuries. Jenne-jeno's dual role as both an entrepot in the long-distance gold, copper, and salt trade and a major production and bulking centre for commerce in staples may already have been established by the last quarter of the first millennium A.D.

AFFINITIES OF JENNE-JENO MATERIAL CULTURE

Ease of communication in the IND is illustrated by the striking degree of uniformity in material culture from geographically disparate sites occupied in the period c. A.D. 900-1400. Accumulating evidence suggests that material culture was extraordinarily homogeneous throughout the upper IND at this time. Pottery and artifacts from Phase IV deposits at Jenne-jeno are virtually indistinguishable from those at Togguèrés Galia (12 km distant) and Doupwil (90 km away), both of which have basal levels convincingly radiocarbon-dated to c. A.D. 1100 (mid-Phase IV at Jenne-jeno) (Bedaux 1977, 1979, n.d.). The predominance of woven twine impression (Twines 1 and 2) on pottery was confirmed as a Phase IV charateristic at Doupwil and Galia, where it accounted for over 80% of all twine-decorated sherds (Bedaux n.d.). This information permits us, for the first time, tentatively to assign a date to some of the sites excavated in the upper IND by Szumowski (see Appendix III in Part i). Based on the high frequency of "barakalé" (= Twine 1) decoration noted by Szumowski, many of these sites can be placed in Phase IV. It must be recalled, however, that because the Jenne-jeno sequence ends by A.D. 1400 at the latest, we do not know the characteristics of material culture between that time and A.D. 1600, at which point smoking pipes were rapidly introduced into West Africa and therefore serve as fossiles directeurs for the period 1600-1900. Much more study will be required to refine farther the chronology of material culture in the IND; current evidence gives an overwhelming impression of cultural conservatism in the region.

In addition to the excavations by Bedaux and Szumowski, the results from Jenne-jeno suggest that the entire upper IND formed a very homogeneous "culture-area" throughout Phase IV. It is now possible to outline a core complex of artifacts and features which are characteristic of Phase IV sites throughout the region:

> Funerary Custom: Inhumation, both primary and secondary, in large urns covered by an inverted carinated pot or a potlid. Few if any grave goods accompany the burial.[8]

Pottery: Common pottery forms include funerary urns, carinated pots, and potlids. These are the most frequently reported forms because: excavation often focuses on cemeteries where these are all major components in the funerary complex; and carinated pots and potlids are cooking wares which are more likely to remain intact than other, less durably constructed pottery. Other forms tend to have simple or very slightly everted rims. Red slip, slightly burnished, is very common. "Barakale" (Twine 1) decoration comprises most of the twine-impressed ware. In addition to twine impression, the standard range of Phase IV decorative techniques includes parallel grooving, incision (infrequent), circular impression, and finger impression.

Other Artifact Classes: Stone beads, iron artifacts including simple knives and tanged points.

Other artifacts and features have been found on some, but not all, sites near Mopti and Jenne and may therefore be restricted to certain types or sizes of Phase IV sites. These include: painted pottery (common at Jenne-jeno, a few sherds reported at Doupwil), house foundations of cylindrical brick (at Jenne-jeno, Fatoma), copper rings and hair ornaments, glass beads, net-weights, spindle whorls, pottery with raised relief decoration, and terracotta statuary. In the latter two categories, very similar examples have been recovered from sites almost 100 kilometres apart. Two hollow spheres with snake motifs in raised relief almost identical to the one recovered from M2 at Jenne-jeno have been reported from sites near Mopti (Masson-Detourbet 1953; Szumowski 1955).[9] An object similar in size and shape to the "pestle" from M2, Level 2 was also found at Mopti (Masson-Detourbet 1953: 101); it had a raised relief "lizard" motif similar to that on potlid knobs from M2 (see Appendix II, Fig. 44 in Part i). The two major styles of terracotta statuary that can be identified in the corpus of published examples have an equally wide distribution (see esp. Evrard 1977). Statuettes with flattened faces, characteristic incision around the eyes, and a cross-hatched rectangle on each temple are reported from several sites near Jenne and Mopti (Koa - Ligers 1957; Kami - Mauny 1949; Kaniana - Monod 1943; Jenne region - African Arts cover, February 1979). Statuettes in a kneeling posture with no markings on the body have been found at Kami (Malzy 1967; Szumowski 1955) and Jenne-jeno (McIntosh and McIntosh 1979). A variant of this second style, with clay buttons applied all over the surface of the statuette, has also been noted at the widely separated sites of Kao (H aselberger 1966) and 293-23-A near Jenne (McIntosh and McIntosh 1979). The significance of these different terracotta styles is unknown. Thermoluminescence dates (Bedaux 1977: 19) and the radiocarbon date for the Jenne-jeno statuette suggest that the major period of statuette production was between A.D. 1000 and 1600.

No archaeological investigation has been undertaken in the central IND. It is therefore impossible to say how wide a distribution the Phase IV IND culture complex described above may have achieved. Excavations in the Macina region to the west of the IND and in the lakes region in the lower IND indicate strong affinities among the material culture from all three regions. The material from the very large site of Péhé in the Macina is strikingly similar to the finds from Jenne-jeno, with potlids, bottles, and "barakalé"

decorated funerary urns. The carinated bowls of the upper IND appear to be absent, however, and there is a larger number of footed cups and pedestalled bowls than are normally seen in the IND (Szumowski 1957a). These shapes are far more reminiscent of the lakes region (Avinen 1942; Desplagnes 1903). Péhé surely deserves re-examination, given its apparent mixture of southern (upper IND) and northern (lakes region or Ghana?) characteristics, as well as its impressive dimensions (1000 x 700 x 6 m - Szumowski 1957a: 240).

Pottery recovered by Desplagnes from the large tumuli of Killi and Oualadji near Goundam in the lakes region has for decades been considered to be prototypical of 'medieval Sudanic pottery'. The range of pottery forms represented in these tumuli has attracted particular attention:

> Medieval Sudanic pottery is quite distinct from that of pre-medieval times. The diagnostic forms comprise the carafe or long-necked water flask, the calciform jar, the trunco-conical jar, the pedestalled bowl, the carinated bowl, and the footed cup. The sudden appearance of these forms in medeival contexts has been interpreted as representing local attempts at copying imported Maghrebian pottery traditions (Anquandah 1976: 28).

It is now clear that three of these forms—the long-necked flask (i.e., the bottle), the pedestalled bowl, and the carinated bowl—are present by A.D. 400 at Jenne-jeno. Indeed, the carinated bowl is a characteristic ware in Phase III (A.D. 400-900). The significance of these forms at such an early date cannot be evaluated at present. I think that it is preferable not to postulate an Ibero-Maghrebian Bronze Age influence as Monod did (Monod 1955), but the question of possible Mediterranean origins (Roman North Africa?) for these forms at Jenne-jeno remains moot. It seems equally plausible that carination, pedestalled bases, and bottles evolved quite indigenously out of a generalized southern Saharan/Sahelian pottery tradition.

Painted pottery is present at Jenne-jeno as early as Phase I, with red, yellow, white, and magenta represented. The highest relative frequency of painted pottery occurs in Phase III, when carinated bowls commonly are decorated above the carination with a series of parallel grooves filled in with various colours of paint. Phase III deposits at Jenne-jeno also yielded ten sherds of white-on-red geometric painted ware (see Part i, Appendix II, Fig. 4 for an example from late Phase III). Thus far, this style of pottery, with its distinctive white cross-hatched geometric designs on well-burnished, deep-red slip, is best known from the tumulus at Kouga (Goundam region), dated to A.D. 1000 $\pm$ 120 (Mauny 1964; Davies 1967: 261). We suggest that the Kouga pottery is related to the older Jenne-jeno geometric painted ware, which also includes several sherds of black-on-white painted pottery. The latter, too, is characterized by geometric motifs, including cross-hatched diamonds, and solid painted squares and triangles. In Phase IV at Jenne-jeno, painted geometric designs give way to comb-impressed geometric designs. Chevrons and triangles are executed on red-slipped pottery with a fine, rectangular-toothed comb. Interestingly, much of the red-slipped pottery at Killi and Oualadji has chevron and triangle designs impressed by a coarse, round-toothed comb (Lebeuf and Paques 1970).

Present evidence suggests that there may be a third style of Sudanic painted pottery (in addition to the paint-in-groove and geometric painted wares already mentioned) which owes something to Arab influence. One pot from the top of M2 has an unusual black painted design consisting of arcs and dots (Part i, Appendix II, Fig. 43). This same painted design, in red, has been reported on a pot from Killi (Lebeuf and Paques 1970: 10). Two large sherds with a similar design, also in red, have come from Koumbi Saleh (Thomassey and Mauny 1951, 1956). The "arc-and-dot" design-painted pot from Jenne-jeno, plus spindle whorls and glass beads, constitute the total evidence presently available for Jenne-jeno's interaction, however direct or indirect it may have been, with the Arab world in Phase IV.

Interaction between the lakes region and the upper IND throughout Phase IV is strongly indicated by the pottery styles in the two regions. Other aspects of material culture are very different: tumulus burials in the lakes region have revealed an abundance and diversity of grave goods as well as a sophisticated copper and bronze technology. Future excavations will undoubtedly clarify this picture considerably; for example, we discovered a large tumuls (150 m diameter, 7-10 m high) on a dune near Jenne (described in Part ii: Chap. 5 of this monograph). Many features of the tumulus, including its size and the presence of smaller, auxiliary mounds around its base, suggest its relationship to the tumuli of the Goundam region.

Affinities outside the Inland Niger Delta

Unfortunately, too little has been reported on the pottery from other sites north of the IND, —e.g., Timbuktu, Tegadoust, Gao, —to warrant any discussion of their relation to the pottery of the Goundam region and the upper IND. The few sherds published from Gao (Mauny 1951b: 848-850, 1961: 350; Anquandah 1967: 77-80) indicate general similarities to the tumuli pottery from the Goundam region: Gao has polychrome ware (white, black, red, and yellow), various carafes and piriform vases, and geometric decorations impressed with a large, round-toothed comb. Based on these similarities to the Goundam pottery, we may suspect that the Gao pieces date to somewhere between A.D. 1000-1400 (Mauny's estimates of 12-14th century seem very reasonable), but it must be stressed that no published pottery from Gao has been retrieved from a securely dated context.

To the south of the IND, the lack of systematic analyses and publication of excavated artifacts again hinders comparisons with material from Jenne-jeno. Only one site can be said to demonstrate convincing affinities with Jenne-jeno based on similarities in material culture. The domestic pottery at Rim (Upper Volta) is strikingly similar to the bulk of the Jenne-jeno ceramics: twine impression (especially Twines 1 and 4) is extremely common. Rims are usually not decorated by impression but are frequently slipped and burnished; rim shape is usually simple or slightly everted. Funerary urns almost indistinguishable from those at Jenne-jeno are present at Rim; bone from one yielded a radiocarbon date of A.D. 390 $\pm$ 225 (Wai-Ogusu 1973: 85). The earliest urn burials at Jenne-jeno appear to date between A.D. 200-400.

With reference to other areas to the south of the IND, the Jenne-jeno research has done little to either support or refute claims that certain changes in material culture, including the introduction of Kintampo lithics, armrings,

etc. (Davies 1961; Goody 1966; Davies 1967: 222), iron (Davies 1966b; Goody 1966; Shaw 1969: 229), red-slipped, carinated pottery (Cisse and Thilmans 1968: 15), Gonja painted pottery (Davies, 1964, 1969; Matthewson 1968; Posnansky 1975a: 29), and architectural styles and technologies (Prussin 1970; Posnansky 1977: 52) emanated from the Middle Niger. Jenne-jeno post-dates the Kintampo 'Neolithic' by a millennium; but it is now possible to state that if northern influences are present in Kintampo material culture, they were not introduced by sedentary agriculturalists from the IND. Regional survey around Jenne indicates that the western IND was not permanently settled in the second millennium B.C. Again, Jenne-jeno offers no direct evidence for the route of introduction of iron into West Africa. The simple iron artifacts found at Jenne-jeno (knives, points, bracelets) are virtually ubiquitous in West Africa and thus offer few clues to the affinities of the early iron industry. The assumption that certain pottery forms (bottles, carinated wares) and surface treatments (burnished red slip, paint) are characteristic of the Middle Niger region in the first half of the second millennium A.D., after their introduction from the north, has been seriously weakened by the Jenne-jeno data. Because these attributes occur as early as the first centuries A.D. at Jenne-jeno, they can no longer be considered a priori as traits foreign to the indigenous sub-Saharan pottery tradition. Although it does appear to be true that early Iron Age Sahelian pottery, with its slipped and burnished simple rims and light twine impression over the body of the pot, contrasts markedly with the flaring, everted rims and deep plastic decoration (including deep incision, stamping, and carved roulette—Gaillard 1923: Pls. I, III; Mauny et al. 1948: 44; Szumowski 1957b, 1958, 1961; Bessac 1964;[10] Filipowiak et al. 1968;[11] Liesegang 1977: 1421) of the savanna regions, too little is known in detail about the distribution of these and other attributes to pinpoint donor-recipient areas of cultural influence. With particular reference to carinated form and painted decoration, we do not know how widespread these attributes are, either along the Niger or to the west of the Middle Niger in the Sahel belt, during the first millennium A.D. It is possible that all these characteristics are part of a generalized first millennium Soninké potting tradition throughout the Sahel. If so, attributing their presence in savanna contexts to contact with the IND or Niger Bend is unwarranted.

The sequence at Jenne-jeno ends too early to be of much use in assessing claims for contact with the Akan forest region (Wilks 1961, Posnansky 1973b, 1973c, 1975a, 1977). A whole complex of cultural features, including painted pottery (known as Gonja or Silima ware), brass figurines, the mithkal weight system, weaving on a narrow loom, and coursed mud architecture are thought to have been brought from the Niger to the Akan region by Mandé traders in the fifteenth and sixteenth centuries (Wilks 1961; Posnansky 1975a). No information on the use of brass, loom types, or weights was recovered from Phase III or IV deposits at Jenne-jeno. The arc-and-dot painted pottery style is the only one at Jenne-jeno that remotely resembles Gonja and Silima painted ware, although in our opinion the resemblance is slight. We need a great deal more information on the pottery of both the Sahel and Savanna regions bordering the IND before we can state with reasonable confidence that Gonja painted pottery was originally inspired by pottery from the IND specifically. With reference to architectural styles, coursed mud technology is

certainly present in Phase III (House 6) at Jenne-jeno. Phase IV seems to be dominated by mud brick technology, however. Whether this represents a true shift in building technology through time or is merely the result of a small excavation sample remains to be clarified in future excavations. In any case, we know that the cylindrical bricks (jenne-fré), which were the hallmark of the Jenne mason throughout the medieval period and into the twentieth century (Prussin 1973: 130), are present at Jenne-jeno throughout Phase IV. We would expect that, if a new building technology were introduced into the savanna and forest regions from Jenne or Jenne-jeno, it would be cylindrical brick, not coursed mud (swish, tauf, banco) as claimed (Posnansky 1977: 52).[12]

One last, possible affinity of Jenne-jeno culture remains to be considered. The fragments of footed bowls found at Jenne-jeno in Phase III and IV deposits (see "Potstands"; Part i, Ch. 9) come from a type of pottery which seems to have a wide distribution along the Niger. Footed bowls have been recognized at Niani, Kangaba, Dogo, Tiebala, Jenne, Galia, Fatoma, and Sanga (Bedaux 1980: 251). These characteristic bowls appear at Niani in the eighth century A.D. (continuing into the fourteenth century—Filipowiak et al. 1968), and are present at Jenne-jeno almost contemporaneously. They have been found in 11-12th century contexts at Dogo (Liesegang 1975: 63) and Sanga (Bedaux 1980: 248). Also relevant is one possible example of arc-and-dot painted ware at Niani from an 11-12th century (?) context (Filipowiak et al. 1968: Fig. 34).

TRADE IN THE EARLY SECOND MILLENNIUM: A REASSESSMENT

In the preceding sections we have presented the archaeological and historical evidence which, in our opinion, supports the argument that the IND served as a major transport axis in the first millennium trade routes linking the Sahara, Sahel, and savanna. We believe that participation on these trade networks was a vital factor in Jenne-jeno's growth. Jenne-jeno's significance is not, however, limited to the first millennium. If Jenne-jeno's prosperity is indeed linked to the Niger trade, then the presence at the site of a large urban complex from c. A.D. 750-1150 also has major implications for our understanding of early second millennium events. In this final section, various passages in Arab and European sources written in the tenth to fifteenth centuries will be reconsidered in the light of the new evidence from Jenne-jeno. In particular, we shall consider references to "Wangara, Island of Gold" and "Palolus," Island of Gold". Numerous details culled from European cartography and Arab manuscripts concerning the location and description of this feature strongly suggest that the island in question is the IND. It is commonly assumed in the literature, however, that Wangara/Palolus must refer to the gold fields of Galam/Bambouk or Bouré.[13] This identification is based on two false assumptions: 1. that an "island of gold" must refer to a source of gold. The numerous early references to Ghana as a "land of gold" with abundant gold fields nearby must convince us thatArab writers commonly (and erroneously) believed that the major trading points for gold were situated near sources of gold; 2. that the "island of gold" could not refer to heavy traffic in gold in the IND in the early second millennium because the IND did not develop as a major trade axis until the fourteenth century at

the earliest (Tymoswki 1967: 82; Devisse 1972: 366; vide supra, Part i p. 59). The existence of Jenne-jeno as an urban centre by at least the late first millennium places this latter assumption in serious doubt.

Mas'udi (died 956-7) was the first to mention an "island of gold dust" located in the territory of the Blacks. He places it in a river which forms vast islands inhabited by Blacks (Mas'udi, in Cuoq 1975: 62). Cuoq comments (1975: 62, footnote 5) that, in fact, the Niger inundates a large area of floodplain during the annual flood, at which time only the highest land remains above water (S.K.M.'s translation). Cuoq is clearly referring to the IND here, since at no other point upstream from Ségou is the gradient small enough to create an extensive floodplain.

Just over a century after Mas'udi, al-Bakri reports on frequently travelled routes from Ghana to Tademekka by boat along the Niger Bend. A route from Ghana to Gao via Ras el-Ma and the flourishing market town of Tirekka (frequented by merchants from both Ghana and Tademekka) is outlined by al-Bakri (in Cuoq 1975: 105). He also describes an alternative route from Ghana to Tademekka (apparently by-passing Gao) utilizing transport on the Niger from Safanku (precise location unknown) to Bughrat (precise location unknown), Tirekka, and finally Tademekka (al-Bakri, in Cuoq 1975: 106). This is our earliest historical proof that Niger trade and transport were flourishing by at least the mid-eleventh century.

The best known description of "Wangara,[14] island of gold", was penned by al-Idrisi in 1154:

> Wangara is a country of gold, celebrated for the purity and abundance of its gold. It is an island 300 by 150 miles. The Nile surrounds it on all sides throughout the year. In August, at the hottest time of the year, the Nile floods the Island, or at least most of it, for the duration of the flood. ...in Wangara, there are celebrated places, the population is rich, the gold is abundant, and the merchandise imported by them comes from the furthest reaches of the earth (al-Idrisi, in Cuoq 1975: 134)

Here, some important new information complements the earlier description by Mas'udi: we now know that the "island of gold" is large, surrounded by rivers, and flooded over its entire expanse annually beginning in August. This is an accurate description of the IND. By contrast, both the Bambouk and Boure regions usually identified as the island of gold are so near the sources of the rivers Bakhoy, Bafing, and Falémé in the southern highlands that no floodplain exists, nor is there an extensive annual flood.

Ibn Sa'id, writing before 1286, adds valuable details on the location of the island of gold which support its identification as the IND:

> The town of Ghana is located on the banks of the Nile of Ghana (the Niger) at 29° long. and 10°15' lat. Here resides the sultan of Ghana. ...To the east of the town, there is the island of gold, whose western extremity lies at 31°30' long., and whose eastern extremity is at 36°30' long. The center of the island is at the same latitude as Ghana. Its width is 2°. On this island, one finds much gold.

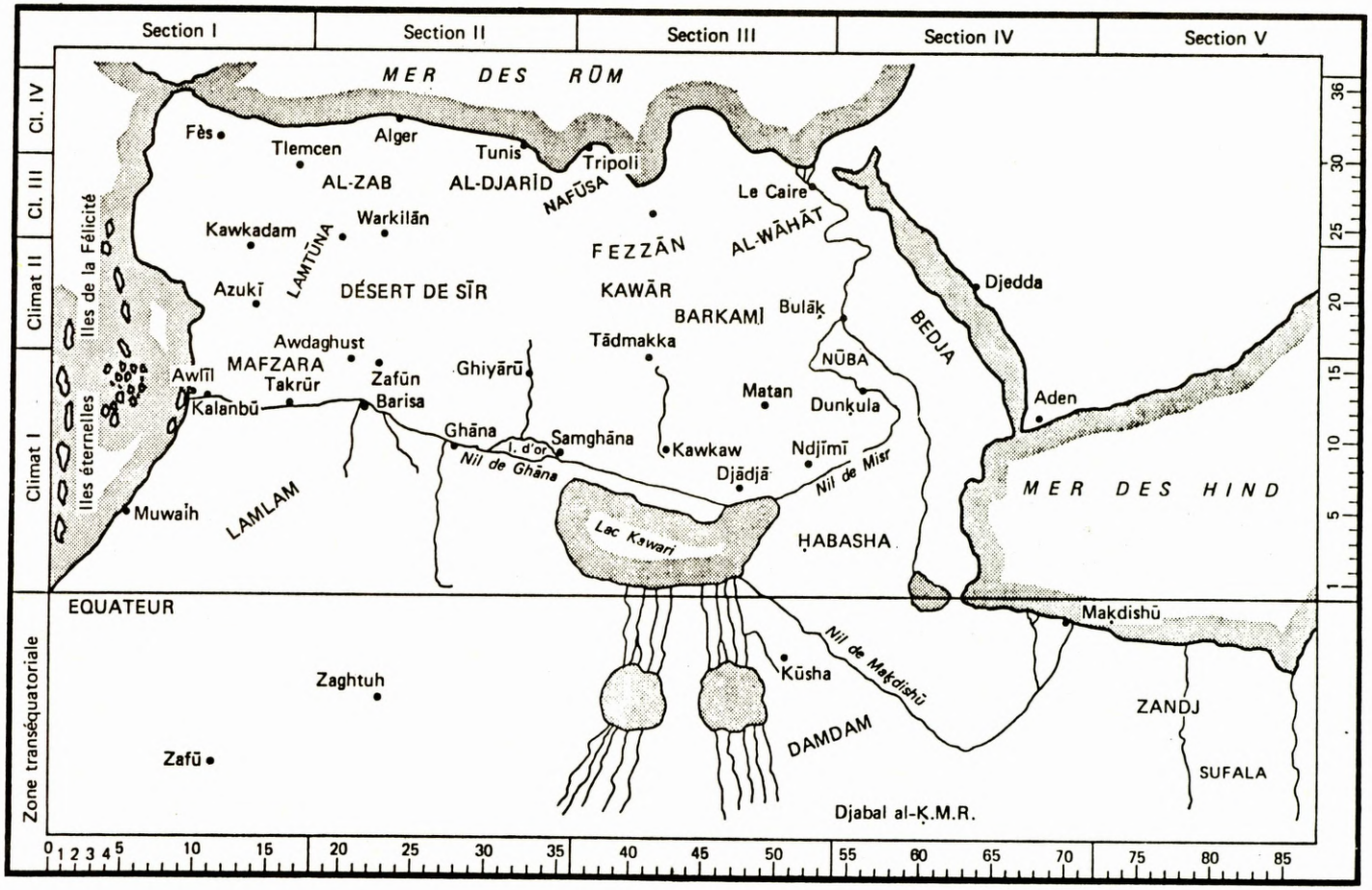
> ...The most famous of the gold towns, after Ghana, is Ghiyaru, which is on a canal of water coming from the south from the Nile (Niger); it lies at 34° long. and 15° lat. ...Kawkaw (Gao) is situated to the east of the river bearing its name (Nile of Kawkaw) at 44° long., 10°15' lat. ...The river (Nile of Kawkaw) continues north of the town parallel to the river of Ghana until it disappears into the sands and marshes of Climate II.
>
> (ibn Sa'id, in Couq 1975: 205-7; S.K.M.'s translation)

This description is sufficiently detailed and at the same time sufficiently vague that it allows various interpretations. A major omission, for example, is Sa'id's failure to provide latitude co-ordaintes for the island of gold. As a result, Kramers was able to translate Sa'id's information into a map (Map 7.3) which has few referents to the actual geography of the Western Sudan. Kramers oriented the island of gold east-west. Yet, ibn Sa'id clearly indicates that the feature is situated along the Nile of Ghana, which at some point flows north-south parallel to the Nile of Kawkaw. By orienting the island of gold northeast-southwest, ibn Sa'id's description makes a great deal more sense (Map 7.4). All Sa'id's latitudinal and longitudinal criteria are met; Ghiyaru now appears to be situated near Goundam, precisely where there are a number of major flood channels flowing from the south from the Niger. Ibn Sa'id has the Nile of Kawkaw flowing north into the desert. This probably refers to the Tilemsi Valley, which seasonally drains rainwater from the Sahara into the Niger just north of Gao. It appears that ibn Sa'id was confused about the direction of flow and about the relation of the Nile of Ghana to the Nile of Kawkaw (i.e., that they do connect at some point). Nevertheless, ibn Sa'id's description is now seen to correspond, without undue manipulation, to the Middle Niger region.

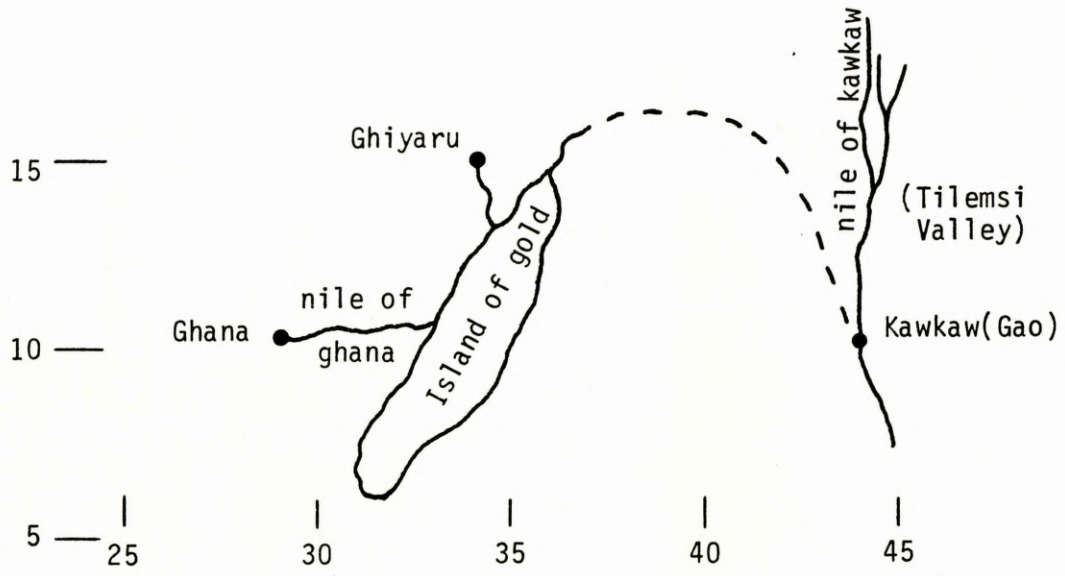
Several European cartographers in the fourteenth and fifteenth centuries also identify an island of gold and place it in the area of the IND. The Genoan planisphere of Giovanni de Carignano (c. 1320) (reproduced in La Roncière 1924: 48-9) indicates an "insula Palola ubi aurum colligitur" situated well to the southeast of Eulezem (= Walata). It should be recalled that Bouré is due south of Walata, and Galam/Bambouk lies to the southwest. Carignano obtained his information from a Genoan merchant in Tafiletl (La Roncière 1924: 43). The Majorcan planisphere of Mecia de Viladestes (1413) (reproduced in La Roncière 1924: frontispiece) shows Tenbuch (Timbuktu) sitting astride as large inland lake which de Viladestes has speckled with gold leaf. No other body of water on the map merits this treatment. Is this feature comparable to Carignano's "Palolus"? If so, Timbuktu's position due north points again to the identification of "Palolus" as the IND.

Summary

The very presence of urban Jenne-jeno from the eighth century to the twelfth century A.D. has significant implications for the interpretation of the historical development of the IND. We have outlined above one aspect of the early Arab and European documentation for the Western Sudan which, we believe, requires reconsideration in the light of the Jenne-jeno data: the identification of Wangara/Palolus, "island of gold". This is presented in the hope that it will lead to new, objective assessments of the early documents



MAP 7.3 The Bilad al-Sudan according to ibn Sa'id as interpreted by J.H.Kramers (J.M.Cuoq, Receuil des Sources Arabes Concernant l'Afrique Occidentale du VIIIe au XVIe Siecle, 1975:2)



MAP 7.4 A reconsideration of the geography of ibn Sa'id's island of gold

by historians trained in the appropriate techniques of textual analysis. Not only does the archaeological research at Jenne-jeno necessitate re-interpretation of the information present in the historical sources, it also demands reconsideration of the information absent from them. J. Devisse's comments are particularly relevant here:

> Are the early sources silent (about the Western Sudan) because nothing existed in West Africa from the point of view of political and social organization, or does their silence merely reflect their ignorance? ...This question posed, it is clear why one has frequently hesitated to reply to it: it places in doubt the absolute value accorded to these texts as the unique and decisive source of information on West Africa (Devisse 1970: 15, S.K.M.'s translation).

The presence of a major urban complex in the Sahel unheralded by the early sources illustrates Devisse's point. At present, our interpretations of West African development are impoverished by exclusive reliance on historical documents. Archaeology must function as a complement to written sources in the historic period, permitting insights into various West African developments which, because of bias, ignorance, or other reasons, were not reported by Arab or European writers. It becomes increasingly important for historians dealing with these texts to consider why the sources remained silent on certain topics, such as the existence of Jenne-jeno and the existence of trade in the IND. If, for example, Wangara/Palolus was in fact the IND, then the silence or exceptional vagueness of the early sources concerning these topics may be resonably accounted for. Presumably, the island of gold was named after the Wangara merchants who controlled the trade in gold and other commodities throughout the region. In the later half of the second millennium A.D., there is abundant evidence that the Wangara (or their later counterparts, the Dyula) deliberately prevented detailed information on the sources and routes of the gold trade from reaching foreign ears. Fernandes, writing in 1506-7, offers a penetrating insight into reports of 'silent trade' between gold producers and Ungaros (Wangara) salt merchants:

> In fact, the Ungaros pretend that they do not know the population of gold gold producers because it is they alone (i.e., Ungaros) who benefit from the exclusive priviledge of penetrating into that region (Fernandes 1938: 89).

It may have been the same deliberate obfuscation which prevented Malfantes from securing any information on the gold trade in 1447 (vide supra, Part i, Ch. 3). In the late nineteenth century, Binger described the same phenomenon in the Ivory Coast, where Dyula merchants organized in confreries effectively maintained a screen between the kola producing regions of the south and the merchants of the Sahel (reported in Mauny 1961: 386).

The new questions raised by Jenne-jeno may well occupy historians and archaeologists alike for years to come. If Wangara/Palolus is the IND, for example, what was the source of the gold? (We suggest that the possibility of early mining at Lobi be investigated). By what route did the gold travel north? (by way of Ghana, Gao, Tirekka, all three?); What other commodities passed along these routes both north and south?; Where was the demand for them centred?; and how did this configuration change through time?

NOTES FOR CHAPTER 7

1. One informant in Jenne, Ousman Cissé, related to us an oral tradition that before the Bozo entered the western IND it was entirely underwater.

2. A major exception is the pottery along the Atlantic coast of Mauritania and Western Sahara (formerly Rio d'Oro) which has a great deal of cross-hatching and channelling (Camps-Fabrer 1966: 471; Hébrard, Hugot, and Thilmans 1970).

3. Our informants in Jenne repeatedly stressed the antiquity and volume of trade between Jenne and Bénédougou.

4. al-Sa'di's story illustrating the density of villages in the western IND (quoted in Part ii, Chapter 2:300) may refer to this period.

5. Early Arab sources repeatedly emphasize the importance of copper and salt trade to the sahel and savanna:

   al-Umari reports that Blacks exchange copper for two-thirds its weight in gold. Copper from Diara is especially in demand (reported in Mauny 1961: 360-1).

   al-Bakri noted that copper was especially in demand at Kouga (Mauny 1961: 370) (Precise location of Kouga is unknown. Mauny 1961: 365 suggests it may be on the Niger somewhere between Bamako and Mopti). We also learn from al-Bakri that Gao got salt from Toutek, six days' travel from Tademekka (Mauny 1961: 332)

   al-Muhallabi (In Cuoq 1975: 78) reports that the royal treasuries at Gao were filled with salt.

   Malfante said copper came from the Byzantine Empire and was with salt the principal product demanded in the Sudan (Mauny 1961: 370)

   Leo Africanus mentions that copper was imported into Jenne (Mauny 1961: 370).

   Ma'den Ijafen offers archaeological proof of the volume of the trade in copper as early as the 11th century. Apparently the remains of an abaodoned caravan load, the finds consisted of 2,085 copper rods, each weighing about a pound, and 3,260 cowrie shells of Indian Ocean origin (Monod 1969). The origin of the copper is usually assumed to have been North African (because al-Bakri reported that copper was exported south from the Maghreb), but Devisse (1972: 361) believes that the question of origin is still open.

6. We have purposely avoided discussing the question of pre-Arab trade, particularly between 500 B.C. - 500 A.D., across the Sahara. The debate on this issue is currently stalemated for lack of evidence. Disagreement centres on the nature and extent of trans-Saharan contacts in pre-Arab times. While everyone agrees, based on the evidence of

Saharan rock art and historical documents (e.g., Herodotus), that travel across the Sahara was then possible, opinion is strongly divided over how frequent and regular these contacts were. On one side are scholars who maintain that the available evidence indicates regular communication and extensive trading contact across the Sahara:

> "These drawings (i.e., chariot rock art) indicate that regular lines of communication were open to the Sudanic belt of West Africa as early as B.C. 500" (Posnansky 1971: 113)
>
> "By the time of Herodotus, the Phoenician cities were trading extensively with the Berbers of the Sahara, bartering cloth and beads and metal goods for ivory, gold, and slaves from south of the desert." (Oliver and Fagan 1976: 9)

On the other side, pre-Arab contact is viewed as sporadic at best, and having little to do with trade:

> "It cannot be stressed too strongly that trans-Saharan trade must have been of inconsiderable volume before the coming of the Arabs in the seventh century a.d., and virtually non-existent before the introduction of the camel (in the first centuries A.D.)" (Mauny 1978: 284)
>
> "In the present state of evidence, even if we are not disposed to deny altogether that the Garamantes ever traded to the Sudan, we cannot assert that this trade was very substantial or important." (Law 1967: 198)
>
> "It may be that rock art "indicates the widely spread usage of a common type of vehicle rather than any complex system of Saharan roadways" (Daniels 1970)

The fact remains that if regular contact and trade did exist in pre-Arab times abundant archaeological evidence of this should exist. Thus far the total evidence available is: a probable Punic fibula and earrings at Akjoujt and some Roman glass, coins, and lamps in the Ahaggar at the tomb of Tin Hinan (Reygasse 1950). It is our opinion that the current stalemate can only be broken by new archaeological evidence.

7. No attempt is made to identify the types of trade structures involved. Various kinds of evidence are required to distinguish between local, regional, and long-distance trade: Fagan (1968, Trade and Raw Materials in South Central Africa, Journal of African History X(1): 1-13) has suggested that usage of standardized weights and sizes for traded commodities (e.g., copper) is a telling indication of "increasing concern with large-scale trade and the development of long-distance trade routes" (p. 8). He also cautions that the mere presence of exotic materials is insufficient grounds for assuming long-distance trade, for these "may merely reflect the final processes of hand-to-hand trade as opposed to formal caravans" (p. 8). Other scholars, notably Renfew (1975, Trade as Action at a Distance, In J. Sabloff and C. Lamberg-Karlovsky (eds.) Ancient Civilization and Trade: 3-59) and Beale (1973, Early Trade in Highland Iran. World Archaeology 5: 133-145) have argued that the spatial distribution

of foreign artifacts or raw materials over a large area has implications for various modes of trade, of which Renfrew recognizes ten (p. 42), whereas Beale settles for a more sensible four: Trickle Trade, Local Redistributive Trade, Regional Organized Trade, and Long-Distance Organized Trade (p. 141-2). Presumably, by Phase III at Jenne-jeno, we are seeing the results of the town's participation in Regional Organized Trade as described by Beale (p. 141). Whether the copper from Phase III deposits reached Jenne-jeno via Long-Distance Organized Trade or Trickle Trade (i.e., hand-to-hand), or Berber middlemen introducing the copper into regional networks at the Niger Bend cannot be determined. There also exists the possibility that copper was secured in the course of expeditions from Jenne-jeno to the Saharan sources, although we consider this unlikely. The crux of the dilemma is the present lack of data on types of foreign artifacts in West African sites, their frequency, and their spatial distribution. In the absence of such evidence, one can only speculate on the structure of the networks in which Jenne-jeno participated. Our purpose in introducing the discussion of indigenous trade networks is merely to suggest an alternative model for first millennium development in the Western Sudan which does not presume contact with the Mediterranean world. Future archaeological data should be evaluated with reference to both the "external stimulus" model and the "indigenous trade" model. We do not for a moment suppose that the truth of West African development lies with either one model or the other. As it so often happens, the truth probably lies somewhere between the two extremes. We will certainly come no closer to it, however, if we continue to look only outside West Africa for clues to its development.

8. Urn burial at Jenne-jeno is documented only for late Phase II and Phase III (c. A.D. 200-900). The only Phase IV burials were two inhumations in M2, one flexed, and one extended. We cannot say at present if urn burial continued into Phase IV at Jenne-jeno at other parts of the site. What is certain is that there is a greater diversity of burial customs at Jenne-jeno than has been reported anywhere else in the IND. This may be related to ethnic diversity at the site, or to increased class or status differentiation absent at smaller sites.

9. Similar to Bozo funerary pots illustrated by Desplagnes (1907: 52).

10. Bessac, H. 1964. Fragments de poterie archéologique de Fouta sénégalais. Notes Africaines 103: 65-72.

11. The increasing use of the term Niani 6D-III ware to describe deeply-stamped, incised, and/or carved rouletted pottery found at sites other than Niani (e.g., Liesegang 1977: 1421; Bedaux 1977: 9) should be discouraged, especially since it is becoming clear that such pottery is found in the savanna belt from western Senegal, through Guinea (Conakry), and into Mali as far east as Bamako.

12. Posnansky (1977: 52) indicates that the mosques at Jenne, Timbuktu, Mopti, and other old centres on the Niger are spectacular examples of swish construction. All our sources in Jenne agree that the mosque is made of jenne-fre covered with an outer facing of mud. The same, we suspect, is true for the Mopti and Timbuktu mosques.

13. La Roncière (1924 : 98) believed that European cartographers placed Palolus at Gangaran (between Bafing and Bakhoy Rivers) or Bambouk (between Bafing and Faleme Rivers).

Crone (1937 : xv) identifies Wangara with the gold-bearing districts of Bambouk and Bouré, bounded on the North by the Senegal River, on the West by the Falémé, on the East by the Niger and on the South by by Tinkasso.

Monteil (1951 : 451) states that Wangara, the island of gold dust on Idrisi's map, represents Bambouk, which resembles an island because it is surrounded on three sides by the Bakhoy, Bafing and Falémé Rivers.

Mauny (1961 : 302) says that Wangara is Bouré.

Levtzion (1973 : 155) - "Bambouk may well have been Idrisi's Wangara".

14. The name Wangara (Wankara, Gangara, etc.) probably refers to a merchant class which controlled the sub-Saharan trade in gold by the early second millennium A.D. In the 14th century, Ibn Battuta used the name Wangara to designate a commercial class of Mandé (Mauny 1961 : 388), although it is probably that the Wangara existed well before this point. Fernandes described the trading activities of the Ungaros in some detail in 1506-1507.

Cuoq (1975 : 135) provides a useful summary of what is known of the Wangara from early historical documentation (translation by S.K.M.):

"al-Bakri signalled the existence of Gangara in the Hawd (Hodh), For him, these Gangara were a tribe. Ibn Battuta recounted that he had met several Black merchants called Wandjarata (dj=g) in Zaghari (probably in the Macina). ...The Tarikh al-Fattash gives them a legendary origin; he makes them brothers of the Wankoré and the Songhay. It should also be noted that it was the Wangara who introduced Islam into Kano and Katsina between 1349 and 1385.

Taking stock of these diverse elements, one can draw the following conclusions:

1. Wangara designates an ethnic group and not a country. It was the Arabs who gave this name to auriferous regions.

2. This group dispersed throughout Ghana (and later Mali) for the purpose of commerce, especially in gold. They had, for this reason, an important role in auriferous regions to which they were, however, foreign.

3. The Wangara originated somewhere east of Mali (according to T. al-Fattash) and had their town somewhere along the Niger (Tirekka in Idrisi): they dispersed throughout the Sudan.

Charles Monteil justifiably compares the Wangara with the present Dyula."

APPENDIX I

GRANULOMETRIC AND PETROGRAPHIC ANALYSIS OF SOIL SAMPLE 110
(Alluvium below Jenne-jeno)

P. Jacobberger

Introduction and Petrology

Petrographic inspection of a soil sample from Jenne revealed that the soil is composed of aggregates of a very fine sand , bonded with a great deal of silt and flocculated clay material. The aggregates possess a very high dry aggregation stability, but disintegrate rapidly when moistened.

The small percentage of sand in the soil is composed largely of clear, unfrosted subangular quartz grains, with 5 to 10% heavy mineral content (primarily pyrozenes, magnetite and limonite). Nearly all sand grains are coated with a fine layer of iron oxides. This gives the aggregated soil a slightly reddish-yellow hue, but the amount of iron present is actually very slight.

Analytical Procedure

Two separate granulometric analyses were carried out on the soil sample: 1) an analysis of aggregate size, and 2) an analysis of individual grain size.

The sample was first placed in a dessicator for three days, in order to insure against excess moisture content; it was then placed in a loosely-covered watchglass and allowed to equilibrate with ambient atmospheric humidity for an additional two days. The sample was then sieved at 0.5ϕ intervals on a Fisher-Wheeler sieve shaker. A sieving time of 10 minutes was chosen rather than the standard 14 minutes, in order to prevent excessive disaggregation due to intergranular abrastion.

At completion of this phase of the analysis, the sample was split, and a subsample of 15% by weight was taken for individual grain-size analysis. The subsample was macerated in deionized water, resulting in almost complete disaggregation. Suspended clays were then decanted and the remaining material was wet-sieved through a 62-micron screen. Clays and silts which passed through the screen were removed for analysis by pipette and settling tube, while the sands which remained on the screen were transferred to a beaker for repeated washing with hydrochloric acid, in order to remove the iron oxide coatings on the grains. All liquid was decanted, washed, and reserved for the settling tube analysis. The sand fraction was then dried and allowed to equilibrate with room temperature and humidity, after which it was weighed and examined under a binocular microscope. The sand was then sieved at 0.25 ϕ intervals for 15 minutes.

Results

Results of the analyses are given in Table 1 and Figures 1 and 2. All measurements of particle diameters are given according to the ϕ scale in which $\phi = \log_2 d$, where d is the particle diameter in millimetres. Two statistical parameters have been applied to each set of data, and appear in Figures 1 and 2:

$$\text{Graphic Mean} = M_z = \frac{\phi 16 + \phi 50 + \phi 84}{3}$$

$$\text{Inclusive Graphic Standard Deviation} = \sigma_x = \frac{\phi 84 - \phi 16}{4} + \frac{\phi 95 - \phi 5}{6.6}$$

Table 1

Granulometric analysis of soil aggregates

ϕ range	sample weight (grams)	cumulative %
-4.0 — -3.5	4.50	10.1
-3.5 — -3.0	7.70	27.3
-3.0 — -2.5	5.21	39.0
-2.5 — -2.0	1.44	42.2
-2.0 — -1.5	8.19	60.5
-1.5 — -1.0	2.70	66.5
-1.0 — -0.5	3.50	74.3
-0.5 — 0.0	3.60	82.4
0.0 — 0.5	2.22	87.4
0.5 — 1.0	1.29	90.3
1.0 — 1.5	0.99	92.5
1.5 — 2.0	0.91	94.5
2.0 — 2.5	0.49	95.6
2.5 — 3.0	0.41	96.5
3.0 — 3.5	0.39	97.4
3.5 — 4.0	0.33	98.1
4.0 —	0.81	100.0

Granulometric analysis of sand fraction in subsample

ϕ range	sample weight (grams)	cumulative %
1.50 — 1.75	0.01	2.3
1.75 — 2.00	0.03	9.3
2.00 — 2.25	0.04	18.6
2.25 — 2.50	0.06	32.6
2.50 — 2.75	0.06	46.6
2.75 — 3.00	0.06	60.6
3.00 — 3.25	0.05	72.2
3.25 — 3.50	0.06	86.2
3.50 — 3.75	0.05	97.8
3.75 — 4.00	0.01	100.0

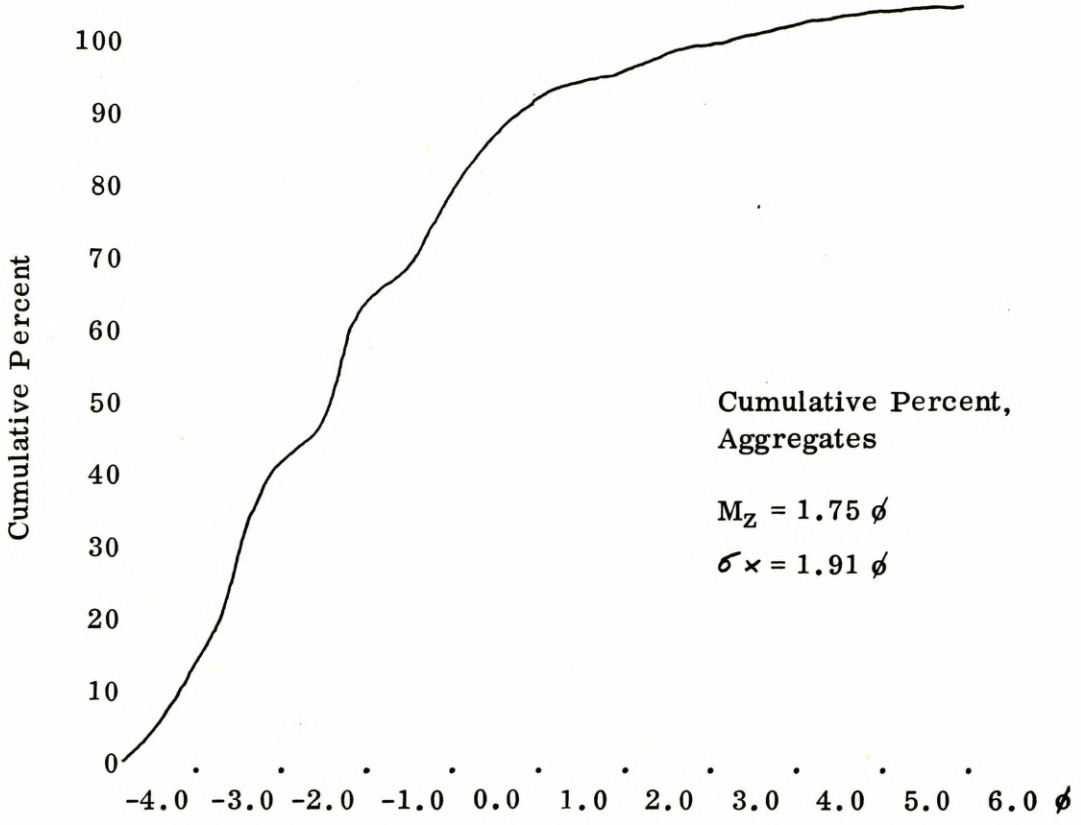


Figure 1: Cumulative weight percent curve for aggregated soil.

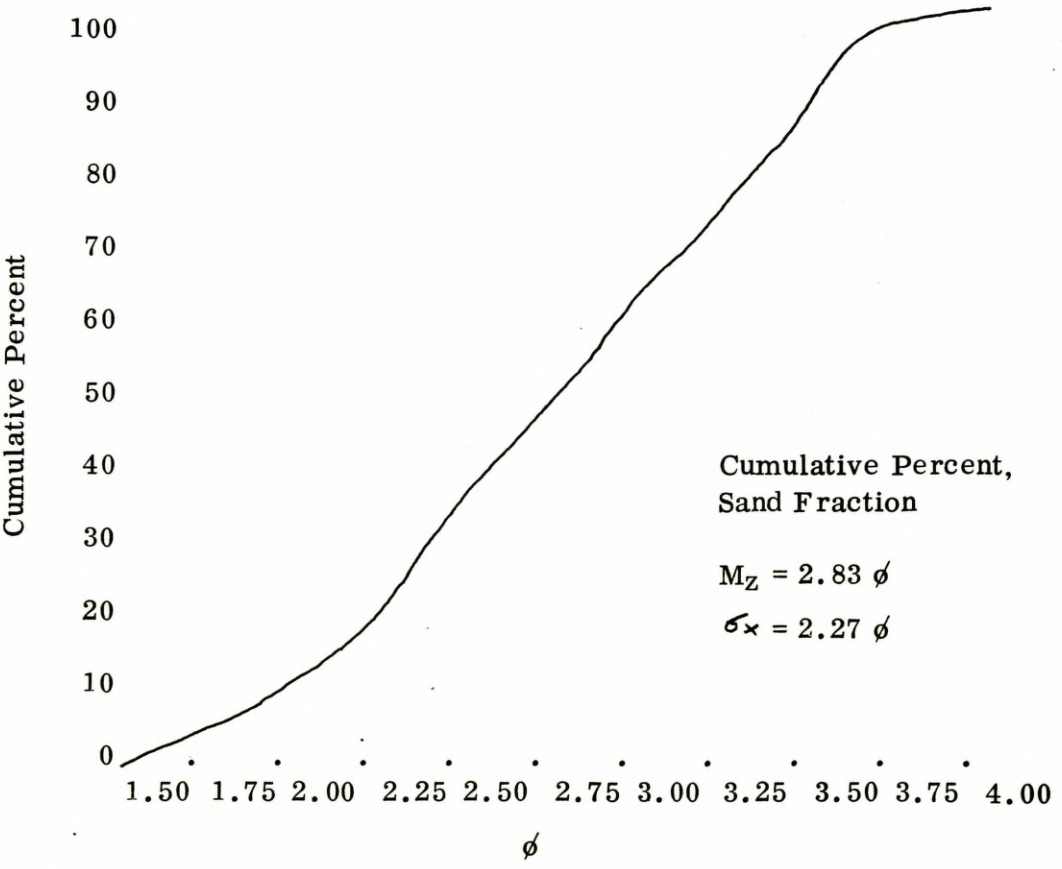


Figure 2: Cumulative weight percent curve for sand fraction of disaggregated soil.

Overall percentages of clay, silt and sand in soil

Clay	66.6%
Silt	26.4%
Sand	7.0%

Conclusions

Examination of the inclusive graphic standard deviation and cumulative curve, both for the aggregate and sand fraction analyses, indicates that both are poorly sorted sediment. In the case of the sand fraction, this is to be expected due to its origin as part of a floodplain silt deposit. It is consistent with the angularity of the grains, since both features are characteristic of an immature sediment. It must be noted, however, that the same rationale does not apply to the lack of sorting of the soil aggregates. In this case, sorting (or the lack thereof) is not a function of sediment transport mechanism but rather is indicative of the progress of in situ agglutination and/or induration of the soil.

APPENDIX II

SURVEY DATA: Formal Survey Area

Name: size in hectares; soil or landform; not visited/confirmed/recorded.*

A. SURVEY WITHIN FOUR KILOMETRES RADIUS OF JENNE (A.P. 291 and 159) see Map 5.2

291-E-1-A: 1.18 ha. (3/2 mm); Low Plain; confirmed.
291-E-1-B: 0.20 ha. (1/1 mm); Low Plain; confirmed.
291-E-1-C: 0.05 ha. (0.5/0.5 mm); Low Plain; confirmed.
291-E-1-D: 0.05 ha. (0.5/0.5 mm); Low Plain; confirmed.
291-E-2: 1.18 ha. (3/2 mm); Low Plain; recorded (Phase IV).
291-E-3: 2.06 ha. (3.5/3 mm); Low Plain; recorded (Phase V).
291-E-4: 0.79 ha. (2/2 mm); Low Plain; recorded (Phase IV) (Kumunra)
291-E-5-A: 11.00 ha. (8/7 mm); Clay Channel; recorded (late Phase IV).
291-E-5-B: 0.59 ha. (2/1.5 mm); Clay Channel; recorded (Phase IV).
291-E-5-C: 0.39 ha. (2/1 mm); Clay Channel; recorded (Phase IV).
291-E-5-D: 0.30 ha. (1.5/1 mm); Clay Channel and Middle Plain-Sand; confirmed.
291-E-5-E: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
291-E-5-F: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
291-E-5-G: 0.05 ha. (0.5/0.5 mm); Clay Channel and Middle Plain-Sand; confirmed.
291-E-5-H: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
291-E-5-I: 0.05 ha. (0.5/0.5 mm); Clay Channel and Middle Plain-Sand; confirmed..
291-E-6: 41.04 ha. (19/11 mm); Clay Channel; recorded (Phase V) (Kaniana).
291-E-7: 8.25 ha. (7/6 mm); Clay Channel; confirmed (?)(Muslim Cemetery).
291-E-8: 19.44 ha. (11/9 mm); Clay Channel; confirmed (Kanafa).
291-E-9-A: 5.89 ha. (6/5 mm); Clay Channel; confirmed (al-Gazuba).
291-E-9-B: 0.39 ha. (2/1 mm); Clay Channel; confirmed (Tonomba).
291-E-10-A: 0.49 ha. (2.5/1 mm); Clay Channel; confirmed.
291-E-10-B: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
291-E-10-C: 0.79 ha. (2/2 mm); Clay channel; confirmed.
159-E-11-A: 8.84 ha. (9/5 mm); Clay Channel; recorded ((late Phase IV) (Hambarketolo).
159-E-11-B: 2.95 ha. (4.5/3 mm); Clay Channel; confirmed.
159-E-11-C: 2.16 ha. (5.5/2 mm); Clay Channel; recorded (Phase IV).

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* See Appendix III for full details.

159-E-11-D: 1.18 ha. (3/2 mm); Clay Channel; recorded (Phase III).
159-E-11-E: 0.98 ha. (2.5/2 mm); Clay Channel; confirmed.
159-E-11-F: 0.30 ha. (3/0.5 mm); Clay Channel; confirmed.
159-E-11-G: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-11-H: 0.79 ha. (2/2 mm); Clay Channel; recorded (Phase V).
159-E-11-I: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
159-E-11-J: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
159-E-12-A: 12.37 ha. (9/7 mm); Clay Channel; confirmed (Sitolo).
159-E-12-B: 3.09 ha. (4.5/3.5 mm); Clay Channel; recorded (Phase IV) (Wangaradaga).
159-E-12-C: 1.77 ha. (3/3 mm); Clay Channel; recorded ((late)Phase IV) (Jennemasatolo).
159-E-12-D: 1.18 ha. (3/2 mm); Clay Channel; confirmed.
159-E-12-E: 0.59 ha. (2/1.5 mm); Clay Channel; confirmed.
159-E-12-F: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
159-E-12-G: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-12-H: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-12-I: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-12-J: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-12-K: 0.79 ha. (2/2 mm); Clay Channel; confirmed.
159-E-12-L: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
159-E-12-M: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
159-E-12-N: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
159-E-12-O: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
159-E-13-A: 8.25 ha. (7/6 mm); Middle Plain-Sand; recorded ((late) Phase IV) (Keraje).
159-E-13-B: 0.79 ha. (2/2 mm); Middle Plain-Sand; confirmed.
159-E-13-C: 0.30 ha. (1.5/1 mm); Middle Plain-Sand; confirmed.
159-E-13-D: 0.20 ha. (1/1 mm); Middle Plain-Sand; confirmed.
159-E-13-E; 0.20 ha. (1/1 mm); Middle Plain-Sand; confirmed.
159-E-13-F: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; confirmed.
159-E-13-G: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; confirmed.
159-E-14-A: 5.11 ha. (7/4 mm); Middle Plain-Sand; recorded (Phase V) (Perou).
159-E-14-B: 1.18 ha. (3/2 mm); Middle Plain-Sand; confirmed.
159-E-14-C: 2.21 ha. (4.5/2.5 mm); Middle Plain-Sand; recorded (Phase V).
159-E-15-A: 1.96 ha. (4/2.5 mm); Clay Channel; recorded (Phase IV-V).
159-E-15-B: 0.44 ha. (1.5/1.5 mm); Clay Channel; confirmed.
Jenne-jeno: 33.08 ha. (15/11 mm); Clay Channel; excavated.

MODERN OCCUPATION

Gomnikouboi: 1.18 ha. (3/2 mm); Low Plain.
Kammraga: 1.23 ha. (2.5/2.5 mm); Low Plain.
Alamante: 1.77 ha. (3/3 mm); Low Plain.
Fokolore: 0.30 ha. (1.5/1 mm); Light Levee.
Rounde Sirou: 0.79 ha. (2/2 mm); Light Levee.
Velingara: 0.20 ha. (1/1 mm); Light Levee.
Niala (West): 0.98 ha. (2.5/2 mm); Clay Channel.
Niala (East): 2.06 ha. (3.5/3 mm); Clay Channel.

Jenne: 44.77 ha. (19/12 mm); Clay Channel.
Tiaou-Garbou, Togal Hute: 13.74 ha. (10/7 mm); Clay Channel.
(Sanouna): seasonal; Sand Channel.

B. SURVEY OF AERIAL PHOTOGRAPH 159 (1970 AO 891-500 (MALI))
see Map 5.3

FLOODPLAIN

159-1-A: 1.77 ha. (3/3 mm); Middle Plain-Sand; not visited.
159-1-B: 0.79 ha. (2/2 mm); Middle Plain-Sand; not visited.
159-1-C: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; not visited.
159-1-D: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; not visited.
159-2-A: 0.59 ha. (3/1 mm); Middle Plain-Loam; not visited.
159-2-B: 0.30 ha. (1.5/1 mm); Middle Plain-Loam; not visited.
159-2-C: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; not visited.
159-2-D: 0.79 ha. (2/2 mm); Light Levee; not visited.
159-3: 0.79 ha. (2/2 mm); Low Plain; confirmed.
159-4: 5.30 ha. (6/4.5 mm); Low Plain; recorded (Phase IV).
159-5-A: 2.36 ha. (4/3 mm); Heavy Levee; confirmed by informant.
159-5-B: 0.20 ha. (1/1 mm); Heavy Levee; confirmed by informant.
159-5-C: 0.20 ha. (1/1 mm); Heavy Levee; confirmed by informant.
159-5-D: 0.20 ha. (1/1 mm); Heavy Levee; confirmed by informant.
159-5-E: 0.20 ha. (1/1 mm); Middle Plain-Sand; confirmed by informant.
159-5-F: 0.05 ha. (0.5/0.5 mm); Heavy Levee; confirmed by informant.
159-5-G: 0.05 ha. (0.5/0.5 mm); Heavy Levee; confirmed by informant.
159-6-A: 2.65 ha. (4.5/3 mm); Middle Plain-Loam; recorded ((early) Phase IV).
159-6-B: 0.20 ha. (1/1 mm); Middle Plain-Loam; confirmed.
159-6-C: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; confirmed.
159-6-D: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; confirmed.
159-6-E: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; confirmed.
159-6-F: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; confirmed.
159-7-A: 1.38 ha. (3.5/2 mm); Low Plain; confirmed.
159-7-B: 0.98 ha. (2.5/2 mm); Low Plain; confirmed.
159-8-A: 1.96 ha. (4/2.5 mm); Middle Plain-Loam; not visited.
159-8-B: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; not visited.

HIGHLAND

159-T8-A: not visible; Light Levee and Heavy Levee; recorded (Phase V).
159-T11-A: 0.79 ha. (2/2 mm); Heavy Levee; not visited.
159-T11-B: 0.79 ha. (2/2 mm); Heavy Levee; not visited.
159-T11-C: 0.20 ha. (1/1 mm); Heavy Levee; not visited.
159-T12-A: 1.96 ha. (4/2.5 mm); Heavy Levee; not visited.
159-T12-B: 1.18 ha. (3/2 mm); Heavy Levee; not visited.
159-T12-C: 0.05 ha. (0.5/0.5 mm); Heavy Levee; not visited.
159-T13-A: 1.37 ha. (3.5/2 mm); Heavy Levee; recorded (Phase V).
159-T18-A: not visible; Heavy Levee and Light Levee; recorded ((late) Phase IV).

MODERN OCCUPATION

Diablo: 3.93 ha. (5/4 mm); Light Levee.
Kobasa: 2.75 ha. (4/3.5 mm); Middle Plain-Loam.
Soala: 3.98 ha. (4.5/4.5 mm); Light Levee.

C. SURVEY OF AERIAL PHOTOGRAPH 157 (1970 AO 891-500 (MALI))
See Map 5.4

157-1: 0.59 ha. (2/1.5 mm); Middle P lain-Sand; not visited.
157-2: 0.79 ha. (2/2 mm); Low Plain; seasonally occupied.
157-3: 0.98 ha. (2.5/2 mm); Low P lain; confirmed.
157-4-A: 0.30 ha. (1.5/1 mm); Middle Plain-Sand; not visited.
157-4-B: 0.20 ha. (1/1 mm); Middle Plain-Sand; not visited.
157-4-C: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; not visited.

MODERN OCCUPATION

Yera: 1.77 ha. (3/3 mm); Middle Plain-Sand.

D. SURVEY OF AERIAL PHOTOGRAPH 155 (1970 AO 891-500 (MALI))
See Map 5.5

FLOODPLAIN

155-1: 1.18 ha. (3/2 mm); Sand Channel; not visited.
(155-2: fragment of red Dune).
155-3-A: 0.20 ha. (1/1 mm); Sand Channel; not visited.
155-3-B: 0.05 ha. (0.5/0.5 mm); Sand Channel; not visited.
(155.4-A, B, and C: fragments of red Dune).
(155-5: fragment of red Dune).
155-6: 0.44 ha. (1.5/1.5 mm); Clay Channel; not visited.
155-7: 0.79 ha. (2/2 mm); Sand Channel; confirmed.
(155-8: 0.30 ha. (1.5/1 mm); Middle Plain-Sand; seasonally occupied).
155-9-A: 0.39 ha. (2/1 mm); Sand Channel; not visited.
155-9-B: 0.30 ha. (1.5/1 mm); Sand Channel; not visited.
155-9-C: 0.10 ha. (1/0.5 mm); Sand Channel; not visited.
155-10: 0.79 ha. (2/2 mm); Sand Channel; not visited.
155-11-A: 0.20 ha. (1/1 mm); Clay Channel; not visited.
155-11-B: 0.05 ha. (0.5/0.5 mm); Clay Channel ; not visited.

HIGHLAND

155-T1-A: 4.71 ha. (6/4 mm); red Dune; not visited (probable tumulus).
155-T2-A (Eastern Outlier (EO)): 1.18 ha. (3/2 mm); red Dune; recorded (Phase III).
155-T2-A (Main): 1.77 ha. (3/3 mm); red Dune; recorded (Phase III) (within 155-T4).
155-T2-A (Southeastern Outlier (SE)): 0.79 ha. (2/2 mm); red Dune; recorded (Phase III) (within 155-T4).
155-T2-A (Southern Outlier (SO)): 0.44 ha. (1.5/1.5 mm); red Dune; confirmed (within 155-T4).
155-T2-B: 0.05 ha. (0.5/0.5 mm); red Dune; confirmed (no surface remains).

155-T2-C: 0.30 ha. (1.5/1 mm); red Dune; confirmed (no surface remains).
155-T3-A: 1.18 ha. (3/2 mm); red Dune; not visited.
155-T4-A: 0.79 ha. (2/2 mm); red Dune; confirmed (no surface remains).
155-T5-A: 0.88 ha. (3/1.5 mm); red Dune; not visited.
155-T5-B: 0.79 ha. (2/2 mm); red Dune; not visited.
155-T9-A: 1.72 ha. (3.5/2.5 mm); red Dune; recorded ((early) Phase III).

MODERN OCCUPATION

Debena: 0.98 ha. (2.5/2 mm); red Dune.
Soa: 6.28 ha. (8/4 mm); Middle Plain-Sand.
Pana: 4.71 ha. (6/4 mm); Sand Channel.
Kossouma: 2.75 ha. (4/3.5 mm); Sand Channel.

E. SURVEY OF AERIAL PHOTOGRAPH 291 (1970 AO 891-500 (MALI)) See Map 5.6

FLOODPLAIN

291-1: 0.20 ha. (1/1 mm); Low Plain; not visited.
291-2: 0.20 ha. (1/1 mm); Low Plain; not visited.
291-3: no visible sites; yellow Dune; not visited.
291-4: 2.06 ha. (3.5/3 mm); yellow Dune; not visited.
291-5-A: 0.30 ha. (1.5/1 mm); Clay Channel; not visited.
291-5-B: 0.20 ha. (1/1 mm); Clay Channel; not visited.
291-5-C: 0.20 ha. (1/1 mm); Clay Channel; not visited.
291-6-A: 1.96 ha. (4/2.5 mm); Low Plain; not visited.
291-6-B: 1.38 ha. (3.5/2 mm); Low Plain; not visited.
291-7-A: 1.77 ha. (3/3 mm); Low Plain; not visited.
291-7-B: 0.49 ha. (2.5/1 mm); Middle Plain-Loam; not visited.
291-7-C: 0.05 ha. (0.5/0.5 mm); Middle Plain-Loam; not visited.
291-8: no site; yellow Dune; searched.
291-9: 1.18 ha. (3/2 mm); Middle Plain-Loam; confirmed by informant.
(291-10: fragment of ancient levee).
291-11-A: 6.38 ha. (7/5 mm); Clay Channel; recorded (Phase IV-V).
291-11-B: 1.77 ha. (4.5/2 mm); Clay Channel; recorded (Phase IV).
291-11-C: 0.98 ha. (2.5/2 mm); Clay Channel; confirmed.
291-11-D: 0.44 ha. (1.5/1.5 mm); Clay Channel; confirmed.
291-12-A: 0.30 ha. (1.5/1 mm); Clay Channel; confirmed.
291-12-B: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
291-12-C: 0.20 ha. (1/1 mm); Clay Channel; confirmed.

HIGHLAND

291-T1-A: 1.18 ha. (3/2 mm); Heavy Levee; not visited.
291-T3-A: 0.20 ha. (1/1 mm); Clay Channel; not visited.
291-T8-A: 0.20 ha. (1/1 mm); yellow Dune; not visited.
291-T10-A: 3.54 ha. (6/3 mm); Heavy Levee; confirmed.

MODERN OCCUPATION

Soumatogo:	2.06 ha.	(3.5/3 mm); Heavy Levee.
Siratinti:	2.75 ha.	(3.5/3.5 mm); yellow Dune.
Dianbougou:	0.30 ha.	(1.5/1 mm); Heavy Levee.
Yantela:	0.88 ha.	(3/1.5 mm); yellow Dune.
Senousa:	14.73 ha.	(15/5 mm); yellow Dune.

F. SURVEY OF AERIAL PHOTOGRAPH 293 (1970 AO 891-500 (MALI)) See Map 5.7

293-1-A:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-1-B:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-1-C:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-1-D:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-2-A:	2.36 ha.	(4/3 mm); Sand Channel; confirmed.
293-2-B:	1.18 ha.	(3/2 mm); Sand Channel; recorded (Phase IV-V).
293-2-C:	0.49 ha.	(2.5/1 mm); Sand Channel; confirmed.
293-2-D:	0.05 ha.	(0.5/0.5 mm); Sand Channel; recorded (Phase IV-V).
293-3-A:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-3-B:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-3-C:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-3-D:	0.20 ha.	(1/1 mm); Sand Channel; not visited.
293-3-E:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-3-F:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-3-G:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-3-H:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-3-I:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-3-J:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-4-A:	0.30 ha.	(1.5/1 mm); Sand Channel; confirmed.
293-4-B:	0.20 ha.	(1/1 mm); Sand Channel; confirmed.
293-4-C:	0.20 ha.	(1/1 mm); Sand Channel; confirmed.
293-5-A:	2.65 ha.	(4.5/3 mm); Clay Channel; not visited.
293-5-B:	0.39 ha.	(2/1 mm); Sand Channel; not visited.
293-5-C:	0.39 ha.	(2/1 mm); Clay Channel; not visited.
293-5-D:	0.05 ha.	(0.5/0.5 mm); Clay Channel; not visited.
293-5-E:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-5-F:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-5-G:	0.05 ha.	(0.5/0.5 mm); Clay Channel; not visited.
293-6-A:	0.79 ha.	(2/2 mm); Sand Channel; confirmed.
293-6-B:	0.79 ha.	(2/1 mm); Sand Channel; confirmed.
293-6-C:	0.39 ha.	(2/2 mm); Sand Channel; confirmed.
293-6-D:	0.05 ha.	(0.5/0.5 mm); Sand Channel; confirmed.
293-7-A:	2.06 ha.	(3.5/3 mm); Sand Channel; not visited.
293-7-B:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-7-C:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-7-D:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-8-A:	0.98 ha.	(2.5/2 mm); Sand Channel; not visited.
293-8-B:	0.05 ha.	(0.5/0.5 mm); Sand Channel; not visited.
293-9-A:	2.06 ha.	(3.5/3 mm); Clay Channel; not visited.
293-9-B:	0.39 ha.	(2/1 mm); Clay Channel; not visited.
293-10-A:	0.79 ha.	(2/2 mm); Middle Plain-Sand; confirmed.

293-10-B: 0.39 ha. (2/1 mm); Middle Plain-Sand; confirmed.
293-10-C: 0.29 ha. (1.5/1 mm); Middle Plain-Sand; confirmed.
293-10-D: 0.44 ha. (1.5/1.5 mm); Middle Plain-Sand; confirmed.
293-10-E: 0.20 ha. (1/1 mm); Middle-Plain-Sand; confirmed.
293-10-F: 0.20 ha. (1/1 mm); Middle Plain-Sand; confirmed.
293-10-G: 0.20 ha. (1/1 mm); Middle Plain-Sand; confirmed.
293-10-H: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; confirmed.
293-10-I: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; confirmed.
293-11: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
293-12: 0.79 ha. (2/2 mm); Middle Plain-Sand; confirmed.
293-13: 4.42 ha. (5/4.5 mm); Clay Channel; confirmed.
293-14: 5.11 ha. (7/4 mm); Middle Plain-Sand; recorded (Phase IV-V).
293-15: 0.79 ha. (2/2 mm); yellow Dune; not visited.
293-16-A: 0.39 ha. (2/1 mm); Clay Channel; confirmed.
293-16-B: 0.30 ha. (1.5/1 mm); Clay Channel; confirmed.
293-16-C: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
293-16-D: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
293-17-A: 5.11 ha. (6.4/4 mm); Middle Plain-Sand; not visited.
293-17-B: 2.06 ha. (3.5/3 mm); Middle Plain-Sand; not visited.
293-18-A: 0.30 ha. (1.5/1 mm); Low Plain; not visited.
293-18-B: 0.20 ha. (1/1 mm); Low Plain; not visited.
293-21-A: 1.18 ha. (4/1.5 mm); Clay Channel; confirmed.
293-21-B: 0.88 ha. (3/1.5 mm); Clay Channel; confirmed.
293-21-C: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
293-21-D: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
293-22-A: 0.30 ha. (1.5/1 mm); Low Plain; not visited.
293-22-B: 0.05 ha. (0.5/0.5 mm); Low Plain; not visited.
293-23-A: 1.77 ha. (3/3 mm); Sand Channel; recorded (Phase IV).
293-23-B: 0.88 ha. (3/1.5 mm); Sand Channel; not visited.
293-23-C: 0.88 ha. (3/1.5 mm); Sand Channel; recorded (Phase IV).
293-23-D: 0.39 ha. (2/1 mm); Sand Channel; confirmed.
293-23-E: 0.20 ha. (1/1 mm); Sand Channel; confirmed.
293-23-F: 0.20 ha. (1/1 mm); Sand Channel; not visited.
293-23-G: 0.20 ha. (1/1 mm); Sand Channel; not visited.
293-23-H: 0.05 ha. (0.5/0.5 mm); Sand Channel; not visited.
293-23-I: 0.05 ha. (0.5/0.5 mm); Sand Channel; confirmed.
293-23-J: 0.05 ha. (0.5/0.5 mm); Sand Channel; not visited.
293-24-A: 1.96 ha. (4/2.5 mm); Sand Channel; not visited.
293-24-B: 1.18 ha. (3/2 mm); Sand Channel; not visited.
293-24-C: 0.39 ha. (2/1 mm); Sand Channel; not visited.
293-24-D: 0.20 ha. (1/1 mm); Sand Channel; not visited.
293-24-E: 0.20 ha. (1/1 mm); Sand Channel; not visited.
293-24-F: 0.20 ha. (1/1 mm); Sand Channel; not visited.
293-24-G: 0.05 ha. (0.5/0.5 mm); Sand Channel; not visited.
293-24-H; 0.05 ha. (0.5/0.5 mm); Sand Channel; not visited.

MODERN OCCUPATION

Weraka: 2.75 ha. (4/3.5 mm); Middle Plain-Sand.
Wonon: 2.65 ha. (4.5/3 mm); Clay Channel.

Kanya: 1.57 ha. (4/2 mm); Sand Channel.
Sirmou: 1.77 ha. (3/3 mm); Clay Channel.
Worondjikoi: 0.44 ha. (1.5/1.5 mm); yellow Dune.
Kotola: 1.18 ha. (3/2 mm); Middle Plain-Sand.
Gomitogo: 7.07 ha. (6/6 mm); Low Plain.

G. SURVEY OF AERIAL PHOTOGRAPH 295 (1970 AO 891-500 (MALI))
See Map 5.8

FLOODPLAIN

295-1-A: 0.39 ha. (2/1 mm); Clay Channel; not visited.
295-1-B: 0.39 ha. (2/1 mm); Clay Channel; not visited.
295-1-C: 0.39 ha. (2/1 mm); Clay Channel; not visited.
295-1-D: 0.15 ha. (1.5/0.5 mm); Clay Channel; not visited.
295-1-E: 0.05 ha. (0.5/0.5 mm); Clay Channel; not visited.
295-2-A: 2.95 ha. (5/3 mm); Sand Channel; not visited.
295-2-B: 1.77 ha. (3/3 mm); Sand Channel; not visited.
295-2-C: 0.20 ha. (1/1 mm); Sand Channel; not visited.
295-2-D: 0.20 ha. (1/1 mm); Sand Channel; not visited.
295-2-E: 0.05 ha. (0.5/0.5mm); Sand Channel; not visited.
293-3: 0.88 ha. (3/1.5 mm); Sand Channel; not visited.
295-4-A: 2.70 ha. (6/2.5 mm); Sand Channel; confirmed.
295-4-B: 0.79 ha. (2/2 mm); Sand Channel; confirmed.
295-5-A: 7.07 ha. (9/4 mm); Clay Channel; confirmed.
295-5-B: 1.18 ha. (3/2 mm); Clay Channel; confirmed.
295-5-C: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
295-5-D: 0.20 ha. (1/1 mm); Clay Channel; confirmed.
295-5-E: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
295-5-F: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
295-5-G: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
295-5-H: 0.05 ha. (0.5/0.5 mm); Clay Channel; confirmed.
(295-6: fragment of Sand Channel).
295-7: 0.79 ha. (2/2 mm); Middle Plain-Sand; confirmed.
295-8-A: 1.57 ha. (4/2 mm); Sand Channel; not visited.
295-8-B: 1.77 ha. (3/3 mm); Middle Plain-Sand; not visited.
295-8-C: 1.77 ha. (3/3 mm); Middle Plain-Sand; not visited.
295-8-D: 0.05 ha. (0.5/0.5 mm); Middle Plain-Sand; not visited.
295-10-A: 0.29 ha. (1.5/1 mm); Middle Plain-Sand; recorded (Phase IV).
295-10-B: 0.20 ha. (1/1 mm); Middle Plain-Sand; recorded (Phase IV).
295-15: 2.70 ha. (6/2.5 mm); Middle Plain-Sand; not visited.
295-16-A: 2.95 ha. (5/3 mm); Middle Plain-Sand; not visited.
295-16-B: 1.57 ha. (4/2 mm); Middle Plain-Sand; not visited.
295-18: 0.20 ha. (1/1 mm); Middle Plain-Sand; not visited.

HIGHLAND

295-T4-B: 4.91 ha. (5/5 mm); red Dune; not visited (probably related to 155-T2-A).

MODERN OCCUPATION

MODERN OCCUPATION

Djimatogo: 3.14 ha. (4/4 mm); Middle Plain-Sand.
Koba: 2.35 ha. (4/3 mm); Sand Channel.
Yebe: 4.71 ha. (6/4 mm); red Dune.
Payaba (East): 0.79 ha. (2/2 mm); red Dune.
Payaba (West): 0.44 ha. (1.5/1.5 mm); red Dune.

H. SURVEY ABOVE FORMAL SURVEY AREA
See Map 5.9

LINEAR SURVEY

352-1: 0.30 ha. (1.5/1 mm); Light Levee; confirmed (Muslim Cemetery).
352-Lin-2: 2.95 ha. (5/3 mm); Clay Channel; recorded ((early) Phase IV).
352-Lin-3: 0.59 ha. (2/1.5 mm); Clay Channel; recorded ((early) Phase IV).
352-Lin-4: 2.06 ha. (3.5/3 mm); Clay Channel; recorded (Phase IV).
379-Lin-5: 1.57 ha. (4/2 mm); Clay Channel; recorded (Phase IV).
379-Lin-6: 1.72 ha. (3.5/2.5 mm); Sand Channel; recorded (Phase IV-V).
379-Lin-7: 4.81 ha. (7/3.5 mm); Sand Channel; recorded (Phase IV-V).

MODERN OCCUPATION

Gania: 10.01 ha. (8.5/6 mm); yellow Dune; (AP 352).
Koina: 2.95 ha. (5/3 mm); Light Levee; (AP 352).
Kolele: 0.88 ha. (3/1.5 mm); Sand Channel; (AP 352).
Doundere: 0.39 ha. (2/1 mm); Sand Channel; (AP 350).
Toumi Diaka: 1.18 ha. (3/2 mm); Middle Plain-Sand; (AP 348).
?: 1.38 ha. (3.5/2 mm); Middle Plain-Sand; (AP 348).
Samaye: 2.65 ha. (4.5/3 mm); yellow Dune; (AP 348).
Lanaoune: 0.88 ha. (3/1.5 mm); Sand Channel; (AP 379).
Tou: 0.59 ha. (3/1 mm); Sand Channel; (AP 379).
Yonga-Foulbe: 1.57 ha. (4/2 mm); Middle Plain-Sand; (AP 381).
Yonga-Bozo: 1.96 ha. (4/2.5 mm); Middle Plain-Sand; (AP 381).
Dietenga: 1.57 ha. (4/2 mm); Middle Plain-Sand; (AP 383).

APPENDIX III

RECORDED SITES

Categories of information (and abbreviations).

I. Names: site number and local names, if any.
Location: distance in millimetres and orientation from the Principal Point of the aerial photograph; geographical co-ordinates; distance in kilometres and orientation from the nearest modern settlement.
Landform: geomorphological feature and local subsistence activities.
Soil: after Ahn 1970.
Size: paced, N-S, and E-W and area in hectares; estimated from aerial photograph, area in hectares; height in metres.
Tree cover: light/moderate/heavy.
Thorn cover: light/moderate/heavy.
Confidence in coverage: A= good; B=moderate; C=poor.

II. Surface remains. (Index of complexity: n/9).
House foundations:
A. uncertain shape (cylindrical brick)
B. round house, rectangular brick
C. rectangular house, rectangular brick
D. round house, cylindrical brick
E. rectangular house, cylindrical brick
F. other structures (granaries, wells)
G. fired brick
H. potsherd pavement
I. ceramic bedrest

Cemetery features
J. number of funerary urns in the northeastern quadrant
K. number of funerary urns in the southeastern quadrant
L. number of funerary urns in the southwestern quadrant
M. number of funerary unrs in the northwestern quadrant
N. muslim burials

Metallurgical evidence
O. slag scatter-overall
P. slag concentrations and location
Q. furnace remains
R. tuyère
S. iron artefacts
T. crucible
U. non-ferrous artefacts

Occupations

V. net weights
W. spindle whorls
X. loom weights
Y. grinding stones
Z. gunflints
AA. cowries

Personal

BB. statuettes
CC. tobacco pipes
DD. beads or bracelets

Miscellaneous

EE. defensive wall
FF. ceramic stools
GG. sandstone slabs
HH. all others-describe

Comments: any other information about the condition of the surface of the mound (including evidence of pothunting) and the date of recording.

III. Preliminary ceramic study (N=north, etc.; N cent.=centre-north, etc.)

1. recorder (RJM=Roderick McIntosh; SKM=Susan K. McIntosh)
2. location of sample
3. density of scatter in vicinity-light/moderate/heavy
4. total number of sherds in sample after removal of all but one sherd from the same vessel.
5. fabric (fine=fine fabric, thin walled; medium=medium fabric; coarse=crumbling and always tempered with large grog; grog= grog temper; sand= sand temper; black=organic impurities).
6. colour of fabric (LO=light orange; blk=black; LO/blk= light orange with a black core; DO=dark orange; rust= red-brown).
7. twine decoration predominating (Tw. 1= twine rouletting number one, etc.; grooves= parallel grooves).
8. slip (DO= dark oragne; LO= light orange; CO= clear (bright) orange).
9. paint
10. preparation and firing-well made/good/moderate/poor.
11. other decoration or fabrics.
12. comments
13. other finds within the sample locale

Tentative date of abandonment - by Phase or combined Phases (early/late?) principal criteria for the assignation of Phase.

1. I. Names: 291-E-2; BO.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 91 mm at 228° from the Principal Point; 13°54'40" N/4°34'55" W; c. 2.3 km at 290° from the Jenne mosque.
Landform: Low Plain; fishing in nearby Fokolore marigot.
Soil: Light loam.
Size: paced, N-S = 95 m/E-W = 110 m, 0.82 ha.; estimated from aerial photograph, 1.18 ha; height: c. 2.0 m.
Tree cover: Light.
Thorn cover: Moderate-heavy.
Confidence in coverage: B.

II. Surface remains. (Index of complexity: 0.67).

A. 4	J. 4	(HH). possible burnt house
C. 1	K. 1	
E. 8	V. yes	

Comments: Moderate-light surface scatter of sherds; recorded 25 March 1977 and 21 June 1977.

III. Preliminary ceramic study

1. Stoker	RJM
2. SE	West
3. Light	Moderate
4. 20	44
5. Med. with sand	Med. with sand/blk
6. Light Orange	Buff, 80%; Light Orange, 10%
7. Tw. 2	Tw. 1, n=6; Tw. 2, n=1
8. LO, 20%	LO, 20%; CO, n=1
9. None	White in parallel grooves, n=1
10. Well made	Well made
11,12,13, none	None

Tentative date of abandonment: Phase IV.
Tw. 1 and Tw. 2 predominate; medium fabric, some with sand; well made; (no spindle whorls, no tobacco pipes).

2. I. Names: 291-E-3; Togal Amborou
Location: Aerial photograph (1970 AO 891-500 (Mali) 291; 100 mm at 229° from the Principal Point; 13°54'40" N/4°35'10" W; c. 2.8 km at 283° from the Jenne mosque.
Landform: Low Plain; fishing in nearby Fokolore marigot.
Soil: Light loam.
Size: paced, N-S = 160 m/E-W = 179 m, 2.24 ha.; estimated from aerial photograph, 2.06 ha.; height, c. 2.5 m.
Tree Cover: Moderate.
Thorn Cover: Light-moderate.
Confidence in coverage: A-B.

II. Surface remains. (Index of complexity: 1.44)

A. 1	J. 2	P. SW edge	(HH. Cockle shell
D. 2	K. 1	V. 5	filled with fired
E. 5	M. 2	X. 2	clay).
G. 1	O. yes	CC. many	

Comments: Moderate surface scatter of modern, grossly-slipped sherds; possibility (slight) of defensive wall to the west; one fired brick with elaborate incised decoration, several plain; recorded 25 March 1977 and 21 June 1977.

III. Preliminary ceramic study

1. Stoker	RJM
2. NW	SW
3. Moderate	Heavy
4. 30	82
5. Med. with grog	Med. with grog, some sand.
6. Light Orange	Dark Orange, 40% LO, 20%; CO, 20%; Buff, 10%
7. Most plain, Tw. 1	Tw. 1, n=14 Tw. 2, n=1; Tw. 6, n=1
8. (LO), 50%	DO, n=14; LO, n=13
9. None	None
10. Well made	Well made
11. None	Linear band of recessed dots.
12, 13. None	None

Tentative date of abandonment: Phase V.
Tw. 1, some 6; medium fabric; abundant modern 'zone' slipping; (some spindle whorls, many tobacco pipes).

3. I. Names: 291-E-4; Kumunra
Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 113 mm at 231° from the Principal Point; 13°54'30"/4°35'20"; c. 3.3 km at 275° from the Jenne mosque.
Landform: Low Plain; fishing in nearby Fokolore marigot.
Soil: Light loam to sand.
Size: paced, N-S = 110/E-W= 105 m, 0.91 ha.; estimated from aerial photograph, 0.79 ha.; height, c, 2.0 m.
Tree cover: Light.
Thorn cover: Light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 0.78)

A. 2	J. 11	O. yes
D. 2	K. 7	P. north
	L. 1	

Comments: Moderate to heavy scatter of weathered pottery on the surface; recorded 25 March 1977 and 21 June 1977.

III. Preliminary ceramic study

1. Balzerini	RJM
2. SE	North
3. Moderate	Light-Moderate
4. 35	49
5. Med. with black	Coarse with sand and rhyolite
6. Light Orange	Dark Orange = 40% Grey = 30%
7. Tw. 4	Tw. 1, n=8; Tw. 2, n=5

8.	LO, n=10	LO, n=8
9.	None	None
10.	Well made	Moderate to poor
12.		Several sherds with a talcum feel.
11, 13.	None	None

Tentative date of abandonment: Phase IV
Tw. 1 and 2 predominate, with some Tw. 4; medium to coarse fabric with some sand; moderately well made, some poor; (no spindle whorls, no tobacco pipes).

4. I. Names: 291-E-5-A: Kemendaga.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 119 mm at 125° from the Principal Point; 13°54'15"/4°35'10"; c. 2.5 km at 270° from the Jenne mosque.
Landform: Clay Channel; fishing in the nearby Fokolore marigot and rice cultivation of the Middle Plain-Loam several kilometres to the south.
Soil: Loam.
Size: paced, N-S = 300 m/E-W = 300 m, 7.07 ha.; estimated from aerial photograph, 11.01 ha.; height: c. 0.5-1.0 m.
Tree cover: Light.
Thorn cover: Heavy.
Confidence in coverage: B.

II. Surface remains. (Index of complexity: 0.0).
Comments: Presently a mango plantation and in parts used for growing millet; most surface remains were presumably removed by farmers; thorn trees have collected much wind-borne clay, further obscuring surface remains; recorded 1 April 1977 and 11 June 1977.

III. Preliminary ceramic study

1.	Balzerini	RJM
2.	South	NE
3.	Light	Light
4.	25	45
5.	Med. with some sand	Med. with black
6.	Light Orange	Light Orange
		Slate, n=1
7.	Tw. 2	Tw. 1, n=10
		Tw. 2, n=3; Tw. 4, n=3
8.	LO, 24%	LO-DO, n=11
9.	None	White in grooves, n=1
10.	Well made	Good
12.	None	Much of what formerly was labelled 'forgeron'
11, 13.	None	None

Tentative date of abandonment: (late?) Phase IV
Tw. 2 and 1 predominate; moderately well made; medium fabric; (no spindle whorls, no tobacco pipes).

5. I. Names: 291-E-5-B.

Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 119 mm at 125° from the Principal Point; 13°54'15"/4°35'10"; c. 2.5 km at 277° from the Jenne mosque.

Landform: Clay Channel; fishing in the nearby Fokolore marigot and rice cultivation of the Middle Plain-Loam several kilometres to the south.

Soil: Loam.

Size; paced, N-S = 90 m/E-W = 70 m, 0.49 ha.; estimated from aerial photograph, 0.59 ha.; height: c. 1.0 m.

Tree Cover: Light.

Thorn :Cover: Light.

Confidence in coverage: A.

II. Surface remains. (Index of complexity: 0.56)

A. 9	K. 7	V. yes
J. 6	M. 1	

Comments: Many elongated pot-knobs; this mound badly pot-hunted; recorded 1 April 1977 and 11 June 1977.

III. Preliminary ceramic study

1. Stoker	RJM
2. NE	NE
3. Light	Moderate-Heavy
4. 91	85
5. Med.-hvy. grog	Med. with grog
6. Light Orange	Light Orange, n=20
7. Tw. 2	Tw. 2 predominates Tw. 4, n=2
8. DO (exterior), 20%	LO, n=20
9. None	None
10. Good-poor	Well made
11, 12, 13, None	None

Tentative date of abandonment: Phase IV

Tw. 2 predominates; moderately well made; generally medium fabric; (no spindle whorls, no tobacco pipes).

6. I. Names: 291-E-5-C.

Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 119 mm at 125° from the Principal Point; 13°54'15"N/4°35'10"W; 3.1 km at 272° from the Jenne mosque.

Landform: Clay Channel; fishing in the nearby Fokolore marigot and rice cultivation of the Middle Plain-Loam several kilometres to the south.

Soil: Loam.

Size: paced, (not valid, included 291-E-5-E); estimated from aerial photograph 0.39 ha.; height: c. 1.0 m.

Tree cover: Light.

Thorn cover: Light.

Confidence in coverage: A.

II. Surface remains. (Index of complexity: 0.89)

A. 16	J. 31	M. 16
D. 7	K. 15	O. yes
E. 8	L. 11	P. yes

Comments: Site has an unusually high variety of pottery, all, however, recognizable from Jenne-jeno; recorded 1 April 1977 and 11 June 1977.

III. Preliminary ceramic study

1. Stoker	RJM
2. SW	North
3. Moderate	Moderate
4. 160	101
5. Med., also many fine with sand	Med. with grog Med. with sand, n=2
6. Light Orange-buff	Light Orange
7. Tw. 2	Tw. 2, n=26 Tw. 1, n=11
8. DO, 33%	
9. White linear, n=4	White in grooves, n=1 Black, n=1
10. Well made	Well made
11, 12, 13. None	None

Tentative date of abandonment: Phase IV

Tw. 2 predominates; well made; medium fabric; some paint; (no spindle whorls, no tobacco pipes).

7. I. Names: 291-E-6; Kaniana.

Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 73 mm at 222° from the Principal Point; 13°54'45"N/4°34'10" W; 1.5 km at 310° from the Jenne mosque.

Landform: Clay Channel; fishing in the distributaries and rice cultivation of the floodplain.

Soil: Light loam

Size: paced, N-S = 600 m/E-W = 800-900 m, 40.06 ha.; estimated from aerial photograph, 41.04 ha.; height: c. 1.5 m.

Tree cover: Light.

Thorn cover: Light.

Confidence in coverage: A-B.

II. Surface remains. (Index of complextiy: 2.11)

A. 18	J. 25	Q. probably
B. (?1)	K. 3	S. yes
C. 2	L. 13	W. yes
D. 6	M. 8	AA. yes
E. 9	O. yes	CC. several
G. several	P. cent	GG. (perhaps)
H. yes	W. cent	

Comments: Several parts have been cleared for farming; several fired houses; may have been occupied only in part during Phase V (high density of elaborately painted pottery and several painted designs not seen elsewhere); recorded 25 February 1977, 1 April 1977, and 21 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini	RJM
2. North	SE	Central
3. Light	Light	Heavy
4. 103	32	79
5. Med.-coarse	Med. with sand	Coarse with grog and quartz
6. LO-buff	Light Orange	LO, 30%; Slate, 30%; DO, 10%; White, 15%
7. Tw. 2 followed by Tw. 6	Tw. 1	Tw. 1, n=6; Tw. 2, n=2; Tw. 4, n=3
8. 38%	15%	
9. None	None	None (see Comments)
10. Good	Well made	Good
11, 13, None	None	None
12. (urn field)	None	Many weathered sherds

Tentative date of abandonment: Phase V (many Phase III and IV elements).

Tw. 1 and 2 predominate, with Tw. 6; significant coarse fabric and moderate preparation; (several spindle whorls, several tobacco pipes).

8. I. Names: 159-E-11-A; Hambarketolo

Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 97 mm at 83° from the Principal Point; 13°53'40" N/4°32'40" W; 2.0 km at 120° from the Jenne mosque.

Landform: Clay Channel; fishing in the distributaries; bourgou pastoralism in the ponds and rice cultivation of the floodplain.

Soil: Light loam (much limonite)

Size: paced, N-S = 280 m/E-W = 420, 9.24 ha.; estimated from aerial photograph, 8.84 ha.; height: c. 3.0-4.0 m.

Tree cover: Light-moderate.;

Thorn cover: Moderate.

Confidence in coverage: A-

II. Surface remains. (Index of complexity: 1.22) (incompletely searched)

A. 26	K. 10	P. SE cent, SSW edge
D. 16	L. 16	V. 1
E. 8	M. 9	W. 4
J. 16	O. yes	

Comments: Located immediately to the north of Jenne-jeno and may once have been part of the same mound; some evidence of pot-hunting; recorded 21 June 1977.

III. Preliminary ceramic study

1. Balzerini	Clark
2. Central	SE
3. Heavy	Moderate
4. 106	37
5. Med. with grog	Med. with grog
6.	Buff, 25%; LO, 20%; Blk, 10%; LO/blk, 20%; LO-buff, 20%

7. Tw. 4	Tw. 4, 35% Tw. 1, 25%; Tw. 3, n=1
8. 27%	DO, 25%
9. 1, linear red and yellow	5% white; blk in grooves, n=1
10. Well made	Moderately well made
11, 12, 13. None	None

Tentative date of abandonment: (late) Phase IV
Tw. 4 with Tw. 1 predominate; medium fabric; negligible painted; (four spindle whorls, no tobacco pipes).

9. I. Names: 159-E-11-C.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 91 mm at 83° from the Principal Point; 13°53'55" N/4°32'30" W; 1.8 km at 114° from the Jenne mosque.
Landform: Clay Channel; (see 159-E-11-A).
Soil: Light Loam (much limonite).
Size: paced, N-S = 290 m/E-W = 125 m, 2.85 ha.; estimated from aerial photograph, 2.16 ha.; height: c. 1.0 m.
Tree cover: Light-moderate.
Thorn cover: Moderate.
Confidence:in coverage: B.

II. Surface remains. (Index of complexity: 1.11).

A. 9	J. 16	N. one	P. NNW
D. 4	K. 72	O. Mod.- Hvy.	Q. (possible)
E. 2	M. 1		

Comments: recorded 25 March 1977 and 21 June 1977.

III. Preliminary ceramic study

1. Clark	Balzerini
2. East	NE
3. Moderate	Light
4. 40	54
5. Med. with grog	Med. with grog
6. Buff, 40%; Lo, 30%; LO-buff, 20%; Black, 10%	
7. Tw. 4, 25%; Tw. 1, 15%; Tw. 2, 10%	Tw. 4
8. DO, 50%	17%
9. Blk in grooves, n=1	None
10. Moderate	Well made
11, 13. None	None
12. (much painted pottery to the south)	

Tentative date of abandonment: Phase IV
Tw. 4 with Tw. 1 predominates; small amount of painted; medium fabric; generally well made; (no spindle whorls, no tobacco pipes).

10. I. Names: 159-E-11-E.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 101 mm, at 179° from the Principal Point; 13°53'40" N/4°33' W: 1.8 km at 140° from the Jenne mosque.
Landform: Clay Channel; (see 159-E-11-A).
Soil: Light loam
Size: paced, N-S = 350 m/E-W = 55 m, 1.51 ha.; estimated from aerial photograph, 1.18 ha.; height: c. 2.0 m.
Tree cover: Negligible.
Thorn cover: Moderate-heavy.
Confidence in coverage: B-C.

II. Surface remains (Index of complexity: 1.11).

A. 1	L. 3	T. 1
D. 5	M. 5	V. 1
J. 10	O. Light-med	HH. Calcareous nodules
K. 7	P. NW, SW, W cent	

Comments: Undercut by river to the west; recorded 21 June 1977.

III. Preliminary ceramic study

1. Balzerini	Clark
2. South	SW
3. Light	Moderate
4. 55	39
5. Med. with grog	Med. with grog
6. Light Orange	LO, 50%; DO, 15%; Buff, 15%; Black, 10%
77. Tw. 4	Tw. 4, 40%; Tw. 1, n=2; Parallel grooves, 20%
8. 18%	70%
9. None	several each White, Yellow, Brown; some White in grooves
10. Well made	Good
11, 12, 13, None	None

Tentative date of abandonment: Phase III.
Tw. 4 predominates; generally well made, several paint; (no spindle whorls, no tobacco pipes).

11. I. Names: 149-E-11-H.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 93 mm at 179° from the Principal Point; 13°53'45" N/4°32'55" W; 1.3 km at 130° from the Jenne mosque.
Landform: Clay Channel; (see 159-E-11-A).
Soil: Light loam.
Size: paced, N-S = 140 m/E-W = 125 m, 1.37 ha.; estimated from aerial photograph, 0.79 ha.; height: c. 0.5 m.
Tree cover: Negligible.
Thorn cover: Very light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 0.67)

K. 5	O. Med.-hvy.	R. yes
L. 3	P. SE, SW	CC. 1

Comments: Smithing site (?); recorded 21 June 1977.

III. Preliminary ceramic study

1.	Clark	Balzerini
2.	SW	SW
3.	Light	Light
4.	26	46
5.	Med. with grog	Med. with grog
6.	LO, 40%; Buff, 20%; Blk/LO, 20%; LO-buff, 20%	LO
7.	Parallel grooves, 40%; Tw. 1, n=3, Tw. 4, n=1	Tw. 1
8.	DO, 60%	35%
9.	None	None
10.	Moderate-good	Well made
11, 12, 13.	None	None

Tentative date of abandonment: Phase V.
Parallel grooves 40%; other twines less; (no spindle whorls, one tobacco pipe).

12. I. Names: 159-E-12-B; Wangaradaga.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 92 mm at 201° from the Principal Point; 13°53'55"N/4°33'55"W; 0.7 km at 225° from the Jenne mosque.
Landform: Clay Channel; (see 159-E-11-A).
Soil: Light loam.
Size: paced, N-S = 260 m/E-W = 150 m, 2.06 ha.; estimated from aerial photograph, 3.09 ha.; height: c. 1.0 m.
Tree cover: Negligible.
Thorn cover: Light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 1.11)

A. 20	H. SE	L. 7
D. 15	J. 14	M. 9
E. 2	K. 10	DD. 1
F. 3 (wells?)		

Comments: Small grove to the west; recorded 20 June 1977.

III. Preliminary ceramic study

1.	Balzerini	Stoker	Clark
2.	North	SE	East
3.	Light	Light	Moderate
4.	54	91	32
5.	Med. with grog some coarse, n=2	Med. with grog	Med. with grog
6.		LO-buff	LO, 60%; Buff, 40%

7. Tw. 4	Tw. 2; several parallel grooves	Tw. 1, 30%; Tw. 4, 30%; parallel grooves, 10%
8. 31%	DO, 10%	DO, 75%
9. None	None	5-10% white
10. Well made	Good	Well made
11, 12, 13, None	None	None

Tentative date of abandonment: Phase IV

Tw. 1 and 2, with some 4; some parallel grooves; negligible coarse fabric; (no spindle whorls, no tobacco pipes).

13. I. Names: 159-E-12-C; Jennemasatolo.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 116 mm at 199° from the Principal Point; 13°53'15" N/4°33'50" W; 1.8 km at 213° from the Jenne mosque.
Landform: Clay Channel; (see 159-E-11-A).
Soil: Light Loam.
Size: paced, N-S = 150 m/E-W = 200 m, (2.36 ha.); estimated from aerial photograph, 1.77 ha.; height: c. 1.0 m.
Tree cover: Light.
Thorn cover: Very heavy (almost impassable).
Confidence in coverage: C-

II. Surface remains. (Index of complexity: 0.89)

A. 5	J. 4	V. yes
D. 1	L. 5	W. yes
E. 3	O. somewhat	

Comment: recorded 20 June 1977.

III. Preliminary ceramic study

1. Balzerini	Stoker
2. NE	Central
3. Light	Light
4. 70	114
5. Med. with grog	Med. with heavy grog
6. Light Orange	Light Orange; also LO-buff
7. Tw. 2	Tw. 2
8. 26%	LO, 20%
9. None	None
10. Well made	Good
11, 12, 13. None	None

Tentative date of abandonment: (late) Phase IV

Tw. 2 predominates (Tw. 1 on urns); Medium-heavy grog; (some spindle whorls; no tobacco pipes).

14. I. Names: 159-E-13-A; Keraje.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 105 mm at 186° from the Principal Point; 13°53'35" N/4°33'20" W; 1.5 km at 160° from the Jenne mosque.
Landform: Middle Plain-Sand; (see 159-E-11-A).
Soil: Sand to light loam.
Size: paced, N-S = 275 m/E-W = 200 m, (4.32 ha.); estimated from aerial photograph, 8.25 ha.; height: c. 2.0 m.

Tree Cover: Light.
Thorn cover: Very heavy.
Confidence in coverage: C-

II. Surface remains. (Confidence in coverage: 0.56)
A. 3 K. 4 O. yes
G. several L. 4
Comments: Thorn trees have collected much wind-borne clay, obscuring surface remains everywhere but the edges, where the scatter is heavy; recorded 20 June 1977.

III. Preliminary ceramic study

1. Balzerini	Stoker	Clark
2. North	NNW	Centre
3. Light	Light-moderate	Light
4. 60	120	20
5. Med. with grog	Med. with grog, many with black	Med. with grog
6.	LO-buff	LO/blk, 50%; LO, 30%; Buff, 15%;
7. Tw. 2	Tw. 2	Tw. 1 and 2, n=1 each; parallel grooves, n=2
8. 2%	$<5\%$	DO 25%
9. None	None	None
10. Generally well made	Poor	Moderately well made
11, 12, 13. None	None	None

Tentative date of abandonment: (late) Phase IV
Tw. 2 (but in small amounts); few parallel grooves; moderately well made; (no spindle whorls; no tobacco pipes).

15. I. Names: 159-E-14-A; Perou.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 110 mm at 179° from the Principal Point; 13°53'20" N/4°33' W; 2.0 km at 145° from the Jenne mosque.
Landform: Middle Plain-Sand; (see 159-E-11-A).
Soil: Light loam (much sand).
Size: paced, N-S = 200/E-W = 175, (2.75 ha.); estimated from aerial photograph; 5.11 ha.; height: c. 1.0 m.
Tree cover: Moderate.
Thorn cover: Light to moderate.
Confidence in coverage: B.

II. Surface remains. (Index of complexity: 0.89)
D. 1 K. 4 V. 2
G. 1 O. moderate CC. 5. (perhaps 6)
J. 3 P. NE centre
Comments: Very heavily covered by thorns at the periphery; moderately pot-hunted; recorded 20 June 1977.

III. Preliminary ceramic study

1. Stoker	Clark	Balzerini
2. NE	NW	Centre
3. Moderate	Light-moderate	Moderate
4. 183	36	50
5. Med. with grog	Med. with grog	Med. with grog
6. LO-buff	LO, 25%; Buff, 25%; LO-buff, 25%; LO blk, 25%	
7. Tw. 2; some parallel grooves	Tw. 4, 30%; Tw. 1, 20%; Tw. 2, 15%; parallel grooves, 50%	Tw. 4
8. DO, 25%	60%	34%
9. None	white, 10%; orange, 10%	None
10. Well made	Moderate	Well made
12. None	None	Much slag; frag. tobacco pipe
11, 13. None	None	None

Tentative date of abandonment: Phase V.
Tw. 1, 2 and 4; significant parallel grooves; little paint; generally well made; (no spindle whorls, several tobacco pipes).

16. I. Names: 159-E-14-C.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 108 mm at 180° from the Principal Point; 13°53'25" N/4°33'05" W; 2.0 km at 159° from the Jenne mosque.
Landform: Middle Plain-Sand; (see 159-E-11-A).
Soil: Light loam (with much wind-borne silt).
Size: paced, N-S = 150 m/E-W = 250 m, 2.95 ha.; estimated from aerial photograph, 2.21 ha.; height: c. 1.0 m.
Tree cover: Light.
Thorn cover: Moderate to heavy.
Confidence in coverage: C-

II. Surface remains. (Index of complexity: 0.45).

J. 2	O. yes
M. 2	CC. 5

Comments: Dust and thorns obscure all features in centre; oral tradition (Ousman Cisse) of Rimaibe occupation into the last century; recorded 20 June 1977.

III. Preliminary ceramic study

1. Stoker	Clark	Balzerini
2. NW	NE	North edge
3. Light	Light-moderate	Light
4. 99	21	31
5. Med. with grog	Med. with grog	Med. with grog
6. LO-buff	LO, 50%; Blk, 10%; Buff, 10%; LO-buff 30%	

7.	Tw. 2; some parallel grooves	Tw. 6; Tw. 1	Tw. 4 (most plain)
8.	DO, 30%	65%	23%
9.	Red on org., n=1	None	None
10.	Well made	Moderately-well made	Well made
12.	None	None	4 slag
11, 13.	None	None	None

Tentative date of abandonment: Phase V
Tw. 1, 2, 4, and 6; most undecorated; some parallel grooves; negligible paint; (no spindle whrrls, several tobacco pipes).

17. Name: 159-E-15-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 96 mm at 47° from the Principal Point; 13°53' N/4°31'50" W; 3.8 km at 130° from the Jenne mosque.
Landform: Clay Channel; fishing in the distributaries and rice and sorghum cultivation.
Soil: Heavy loam to clay.
Size: paced, N-S = 195 m/E-w = 118 m, 1.81 ha.; estimated from aerial photograph, 1.96 ha.; height: c. 2.0 m.
Tree cover: Light (ringed).
Thorn cover: Moderate-heavy.
Confidence in coverage: B.

II. Surface remains. (Index of complexity: 1.2).

A. 3	M. 5	U. yes
D. 6	N. 1	W. yes
J. 1	O. yes	DD. ear plug/gaming piece?
K. 1	P. W centre	

Comments: Pottery is much finer at 159-E-15-B, which may be an older site; recorded 25 March 1977 and 21 June 1977.

III. Preliminary ceramic study

1.	Stoker	Stoker
2.	SW centre	NW
3.	Light	Light
4.	93	84
5.	Med. with grog	Med. with grog
6.	LO-buff	LO-buff
7.	Tw. 4; parallel grooves	Tw. 2, 4, and 6 equal; parallel grooves
8.	DO, 25%	DO, 15%
9.	None	None
10.	Moderate	Moderate
11, 12, 13.	None	None (thicked walled-RJM)

Tentative date of abandonment: Phase IV-V.
Tw. 2, 4, and 6, and some parallel grooves; thick walled; (fine spindle whorls, no tobacco pipes).

18. I. Names: 159-4.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 75 mm at 264° from the Principal Point; 13°50'50" N/4°35'50" W; 2.2 km at 105° from Yera.
Landform: Low Plain; rice cultivation and bourgou pasture.
Soil: Loam-light loam.
Tree Cover: Light.
Thorn Cover: Negligible.
Confidence in coverage: A.
Size: paced, N-S = 325 m/E-W = 120 m, (3.07 ha.); estimated from aerial photograph, 5.30 ha.; height: c. 5.0 m.

II. Surface remains. (Index of complexity: 0.67)
A. 1 K. 2 V. yes
C. 3 (recent) M. 2 BB. plastic relief on potlid
Comment: Mound recently used for millet and sorghum cultivation. for which the rectangular seasonal houses (much like those of 157-2) were made; several piles of sherds collected by farmers; recorded 8 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini	RJM
2. SE	North	West
3. Moderate-heavy	Moderate	Light-moderate
4. 326	57	27
5. Med., coarse	Med. with grog	Coarse
6. LO-buff	LO	LO, 60%; buff, 20%; grey, 10%
7. Tw. 1 Tw. 4, n=1	Tw. 1	Tw. 1, n=3; Tw. 2, n=1; Tw. 4, n=1
8. DO, 10%	33%	DO, n=4
9. None	None	None
10. Good	Well made	Poor
11, 12, 13, None	None	None

Tentative date of abandonment: Phase IV
Tw. 1 predominates, with negligible Tw. 2 and 4; generally medium-coarse fabric; moderately well prepared and fired; (no spindle whorls, no tobacco pipes).

19. I. Names: 159-6-A; Kobassa-boro.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 133 mm at 227° from the Principal Point; 13°48'25" N/4°36'30" W; 0.5 km at 37° from Kobassa.
Landform: Middle Plain-Loam; rice cultivation.
Soil: Light clay.
Size: paced, N-S = 90 m/E-W = 280 m, 1.98 ha.; estimated from aerial photograph, 2.65 ha.; height: c. 3.0 m.
Tree cover: Moderate.
Thorn cover: Light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 1.0)

A. 1	E. 2	O. slight
C. 1	K. 1	V. yes
D. 3	M. 1	GG. 1

Comments: Dimensions of the sandstone slab, 80-75 cm by 60 cm, oriented E-W; former site of Kobassa, but no one in the village remembers occupation of the site; recorded 8 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini	RJM
2. S centre	West	E centre
3. Light	Light	Light
4. 164	20	17
5. Med. with grog	Med. with grog	Med. with sm. grog
6. DO/grey	LO/buff	DO, 20%; LO/grey, 40%; Grey, 20%
7. Tw. 1 predom; Tw. 6, n=1 (in bands)	None	Tw. 1, n=4; Tw. 2, n=3
8. DO, n=10	25%	None
9. None	None	None
10. Good	Well made	Well made
11, 12, None	None	None
13. None	None	Pot knob

Tentative date of abandonment: Phase IV (early?)
Tw. 1 predominates; Tw. 6 in bands; medium fabric; generally well made; (no spindle whorls; no tobacco pipes).

20. I. Names: 159-T8-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 56 mm at 100° from the Principal Point; 13°50'50" N/4°32' W; 0.7 km at 240° from Diablo.
Landform: Light Levee and Heavy Levee; millet and soghum cultivation and cattle herding.
Soil: Light loam.
Size: paced, N-S = 140 m/E-W = 60 m, 0.66 ha.; estimated from aerial photograph: (not visible); height: c. 0.0-0.4 m.
Tree cover: Light.
Thorn cover: Light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 0.78)

C. 1	U. 1	AA. 1
O. very light	Z. 1	DD. 2
P. SE		

Comment: Site is not visible on the aerial photograph; possibly a (Bambara?) settlemtn abandoned under Sekou Amadou; recorded 5 June 1977.

III. Preliminary ceramic study

1. RJM	Balzerini	Stoker
2. North	SW	East
3. Light-moderate	Moderate	Moderate
4. 48	103	103
5. Medium	Medium	Medium
6. LO, 40% DO, 60%	LO	LO
7. Tw. 6, n=8; Tw. 1, n=4	Tw. 6, n=20	Tw. 6
8. N=10	n=20	n=15
9. None	None	None
10. Poor	Good	Good-well made
11. Fine fabric - rose, n=9	None	None
12, 13, None	None	None

Tentative date of abandonment: Phase V (late?)
Tw. 6 with Tw. 1 predominates; good-poor preparation; (no spindle whorls, no tobacco pipes, gunflint, beads).

21. I. Names: 159-T13-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 83 mm at 130° from the Principal Point; 13°49'50" N/4°32' W; 2.5 km at 180° from Diablo.
Landform: Heavy Levee; fishing and arboriculture.
Soil: Heavy loam.
Size: paced, N-S = 150 m/E-W = 120 m, 1.41 ha.; estimated from aerial photograph: 1.37 ha.; height: c. 4.0 m.
Tree cover: Light.
Thorn cover: Moderate.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 1.9)

A. 8	K. 9	U. 2 (copper rings)
C. 4	L. 8	V. yes
D. 9	M. 2	W. many, elaborate decoration
E. 7	O. yes	DD. 1
G. yes	P. NW, W,SW	HH. flat ceramic 'tablet' (Tw. 6)
J. 5	R. 1	

Comments: Located between the last levee of the Clay Channel and the ancient levee, next to a perpendicular tributary into the Pondori; recorded 5 June 1977.

III. Preliminary ceramic study

1. RJM	Stoker	Balzerini
2. SW	SE	North
3. Heavy	Heavy	Heavy
4. 111	350	200
5. Coarse	Med. with grog	Med. with grog
6. DO, 40%; Buff 40%	LO	LO

7. Tw. 2, 60%; Tw. 6, 10%	Tw. 2, n=3	Tw. 2
8. n=11	DO, 10%	5%
9. None	None	None
10. Poor	Good	Poor
11, 13. None	None	None
12. Thick walled	None	None

Tentative date of abandonment: Phase V.
Tw. 2 predominates; medium-coarse fabric; heavy chevron decoration; poor preparation; thick walled; (many elaborate spindle shorls, no tobacco pipes).

22. I. Names: 159-T18-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 92 mm at 161° from the Principal Point; 13°48'50" N/4°32'45" W; 1.5 km at 305° from Soala.
Landform: Heavy Levee and Light Levee; millet and sorghum cultivation, herding.
Soil: Heavy loam to clay.
Size: paced, N-S = 260 m/E-W = 230 m, 4.70 ha.; estimate from aerial photogra h: (not visible); height: c. 1.0 m.
Tree cover: Light.
Thorn cover: Moderate-heavy.
Confidence in coverage: B- .

II. Surface remains. (Index of complexity: 1.33)

D. 16	K. 23	U. copper ring
E. 3	L. 15	V. 1
H. 2 (possible)	M. 3	W. 2
J. 4	O. yes	BB. yes

Comments: Very large site, but the boundaries were difficult to determine because of the thick thorn cover at the periphery; Site not visible on aerial photograph; recorded 7 June 1977 and 8 June 1977.

III. Preliminary ceramic study

1. Balzerini	Stoker	RJM
2. NE	NW	South
3. Heavy	Heavy	Moderate-heavy
4. 92	304	99
5. Med. with grog	Med. with grog	Coarse with black
6. LO-grey	Light Orange	DO
7. Tw. 2	Tw. 2 and some parallel grooves	Tw. 1, 20%; Tw. 2, 10%; Tw. 4, 5-10%
8. DO, n=52	n=37	n=40
9. Blk in parallel grooves, n=2	None	White and red, n=4
10. Well made	Good	Moderate-good
11. 3-4 sherds of blk and orange painted nearby	Lg. sherd, rim 11, carinated, Tw. 4.	Statuette torso with single arm.

12, 13, None None None

Tentative date of abandonment: Phase IV (late but several elements of Phase III)

Tw. 2 and some Tw. 1; medium-coarse; some design painting; (two spindle whorls, no tobacco pipes).

23., 24., 25.

I. Names: 155-T2-A (Main, Southeastern and Eastern Outliers)

Location: (Main), Aerial photograph (1970 AO 891-500 (Mali)) 155; 110 mm at 359° from the Principal Point; 13°54'20" N/4°44'20" W; 4.2 km at 222° from Soa.

Landform: red Dune; millet cultivation and arboriculture; herding after the harvest.

Soil: Sand.

Size: paced, N-S = 150 m/E-W = 150 m, 1.77 ha. (outliers are approx. 100 by 100 metres); estimated from aerial photograph: Main—1.77 ha., SE Outlier—0.79 ha., E Outlier—1.81 ha.; height: Main—7.0-10.0 m, outliers, c. 5,0 m.

Tree cover: Light to moderate.

Thorn cover: None.

Confidence in coverage: A.

II. Surface remains. (Index of complexity: (Main) 0.11, (SE Outlier) 0, (E Outlier) 0)

Main: R.1

Comments: These appear to be one of the classic Malian earth 'tumulus groups', not previously reported from the upper Inland Niger Delta; surfaces are used for millet cultivation and tended palm trees cover the presumed tumulus (Main); a small basin lies between the southern outliers (borrow pit?); recorded 15 June 1977.

III. Preliminary ceramic study

1. Stoker	Stoker	Balzerini	RJM
2. S, E Outlier	N cent, Main	W, SE Outlier	E, Main
3. Moderate	Light	Light	Light
4. 181	106	50	42
5. Med-coarse	Med, some sand	Med. with grog	Med, some fine
6. LO, some buff	Buff, some grey	Light Orange	LO, some buff
7. Tw. 4 and 2	Tw. 4 and 2 (in heavy herringbone)	Tw. 4	Tw. 4, 40%; some Tw. 2 (heavy)
8. n=90	n=54	n=16	LO
9. Wh in grooves n=9	Org/yellow n=2	White, n=1	Wh in grooves, n=5; blk, n=1
10. Well made	Good	Well made	Well made
11-13. None	None	None	None

Tentative date of abandonment: Phase III (all).

Tw. 4 predominates heavily, twith Tw. 2 in herringbone; predominately medium to fine fabric and well prepared and fired; significant paint; (no spindle whorls, no tobacco pipes).

26. I. Name: 155-T9-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 155; 103 mm at 328° from the Principal Point; 13°53'50" N/4°45'30" W; 2.3 km at 48° from Debena.
Landform: red Dune; millet and sorghum cultivation; herding.
Soil: Sand to light loam.
Size: paced, N-S = 150 m/E-W = 150 m, 1.77 ha.; estimated from aerial photograph, 1.72 ha.; height: c. 2.0 m.
Tree cover: Light.
Thorn cover: None.
Confidence in coverage: A-B.

II. Surface remains. (Index of complexity: 0.22)
A. 4 O. light
Comments: Visible mound is probably this site, but there may have been some confusion in the field; northern half now cultivated, and the southern half has been recently; features have been removed from the surface; recorded 15 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini
2. West	Centre
3. Light	Very light
4. 75	26
5. Med. with grog	Med. with grog
6. LO/buff	Light Orange
7. Tw. 4	Tw. 6
8. 45%	50%
9. parallel grooves with white paint	None
10. Good	Well made
11, 12, 13. None	None

Tentative date of abandonment: Phase III (early)
Tw. 4 and Tw. 6 predominate; generally well made; some paint; (no spindle whorls, no tobacco pipes).

27. I. Names: 291-11-A.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 103 mm at 59° from the Principal Point; 13°57'25" N/4°40'10" W; 1.4 km at 110° from Dianbougouj.
Landform: Clay Channel; fishing, rice cultivation.
Soil: Heavy loam.
Size: paced, N-S = 220 m/E-W = 150 m, 2.59 ha. (paced only the thorn-free top); estimated from aerial photograph, total site-6.38 ha. (thorn-free top = 2.36 ha.); height: c. 5.0 m.
Tree cover: Light-moderate.
Thorn cover: Light at top; very heavy at the margins.
Confidence in coverage (top only): A-B.

II. Surface remains. (Index of complexity: 1.44)

C. 1	K. 7	Q. (perhaps)
D. 15	L. 1	V. many
E. 28	M. 6	W. a few
G. several	O. moderate-heavy	Y. yes
J. 15		HH. fragments of magenta daga

Comments: A very substantial site on the right bank of the channel of the Souman-Bani; any trace of a city wall would be entirely obscured by the thorns at the margins of the site; recorded 9 June 1977.

III. Preliminary ceramic study

	Stoker	RJM
1. Balzerini	Stoker	RJM
2. NW	S centre	NE
3. Moderate	Moderate	very heavy
4. 40	265	214
5. Med. with grog	Med-coarse	Med-corase; fine, 10%
6. Light Orange	Light Orange; buff/grey	LO, 50%; buff, 30%; DO/rust, 20%
7. Tw. 1 (coarse)	Tw. 1; stippled, n=1	Tw. 1, 20%; Tw. 1 (coarse), 10%; Tw. 6, 5%
8. 25%	DO, 25%	80%
9. None	None	None
10. Well made	Good	Well made
11, 12, 13. None	None	None

Tentative date of abandonment: Phase IV-V.
Tw. 1 predominates, with some Tw. 6; some coarse fabric; (some spindle whorls; no tobacco pipes).

28. I. Names: 291-11-B.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 291; 98 mm at 54° from the Principal Point; 13°57'40" N/4°30'20" W; 0.7 km at 100° from Dianbougou.
Landform: Clay Channel; fishing and rice cultivation, high levee nearby.
Soil: Heavy-loam to clay.
Size: paced, N-S = 100 m/E-W = 90 m, 0.71 ha (badly in error because of the thorn cover); estimated from aerial photograph: 1.77 ha; height: c. 3.0 m.
Tree cover: Light.
Thorn cover: Moderate to heavy.
Confidence in coverage: C.

II. Surface remains. (Index of complexity: 0.67)

C. 1	E. 4	K. 2
D. 1	J. 2	

Comments: Thorn cover prevented complete surface recording; recorded 9 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini	RJM
2. East	SE	West
3. Light	Light	Light
4. 127	54	65
5. Medium-coarse	Med. with black	Med. with sand Med. with sm. grog
6. LO-buff/blk	Light Orange	LO, 50%; buff, 40%; DO, 5%
7. Tw. 1 predominates; Tw. 3, n=1; stippled, n=1	Tw. 6 some	Tw. 1, n=4, Tw. 4, n=1
8. n=25	n=26	n=13
9. None	None	None
10. Well made	Well made	moderate
11, 12, 13. None	None	None

Tentative date of abandonment: Phase IV.
Tw. 1 predominates (a few Tw. 4 and 6); medium with sand or small grog (some coarse); (no spindle whorls, no tobacco pipes).

29., 30.

I. Names: 293-2-B and 293-2-D.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 293; 56 mm at 312° from the Principal Point; 13°58'40" N/4°39'40"W; B=0. 4 km at 206° from Kanya; D=0.4 km at 230° from Kanya.
Landform: Sand Channel; fishing, sorghum and rice cultivation.
Soil: Very light loam.
Size: paced, B=N-S = 85 m/E-W = 130 m, 0.87 ha., D=N-S = 30 m/E-W = 25 m, 0.06 ha.; estimated from aerial photograph: B= 1.18 ha., D= 0.05 ha.; height: B= c. 4.0 m, D= 4.0-3.5 m.
Tree cover: Light-moderate.
Thorn cover: Light.
Confidence in coverage: A-B.

II. Surface remains. (Index of complexity: B= 1.0; D= 0.56).

B:	D.2	K. 5	V. yes
	E. 7	O. yes	W. yes
	J. 1	P. SE, W centre	DD. beads
D:	A. 10	K. 7	O. very heavy
	J. 4	N. yes	

Comments: B= Cleared land of an old plantation in the centre; surface scatter very light; D= Modern Muslim cemetery, covered by a confused mass of foundations, to the north and south of which are urns in linear alignment; recorded 14 June 1977.

III. Preliminary ceramic study

1. RJM	Balzerini	RJM
2. D= south	B= south	B=west

3.	Light	Light	Light
4.	58	40	24
5.	Med. with grog 70% Med. with blk, 20%	Med. with grog	Med. with grog; some coarse.
6.	Grey, 60%; LO, 30%	Light Orange	
7.	Tw. 1, 40%; Tw. 4, 10%; paral. grooves common	Tw. 4	Tw. 1, n=11 Tw. 4, n=4
8.	c. 50%	c. 50%	c. 20%
9.	None	None	None
10.	Good-well made	Well made	Good to poor;
11.	None	None	Several thick walled
12, 13.	None	None	None

Tentative date of abandonment: B=Phase IV-V; D=Phase IV-V. B & D: Tw. 1 and c. 40%, some Tw. 4; only good preparation; (some spindle whorls, no tobacco pipes).

31. I. Names. 293-14.

Location: Aerial photograph (1970 AO 891-500 (Mali)) 293; 130 mm at 236° from the Principal Point; 13°54'20" N/4°35'40" W; 4.1 km at 274° from the Jenne mosque.

Landform: Middle Plain-Sand; fishing, rice cultivation.

Soil: Light loam.

Size: paced, N-S = 325 m/E-W = 250 m, 6.38 ha.; estimated from aerial photograph: 5.11 ha.; height: c. 1.0 m.

Tree cover: Moderate.

Thorn cover: Moderate to heavy.

Confidence in coverage: B.

II. Surface remains. (Index of complexity: 1.56)

A. 25	L. 4	V. 1
D. 5	M. 6	X. yes
E. 12	O. yes	AA. 1
J. 33	P. SW, E centre	DD. clay pendant
K. 5	U. lead (?)	

Comments: Recorded 1 April 1977 and 21 June 1977.

III. Preliminary ceramic study

1.	Stoker	Balzerini	RJM
2.	S centre	SE	SW
3.	Light	Heavy	Moderate-heavy
4.	115	50	60
5.	Med-coarse	Med. with grog	Med. with grog, 33% Med. with sand, 66%
6.	LO/buff	Light Orange	Buff, 40%; LO, 30%; rose, 10% (med-sand)

7. Tw. 2	Tw. 2; parallel grooves, n=1	Parallel grooves, many; Tw. 1, n=1
8. 14%	20%	30%
9. None	None	White, geometric and zones, many
10. Well made	Well made	Well made
11, 12, 13. None	None	None

Tentative date of abandonment: Phase IV-V (some Phase III elements). Tw. 1 and 2 predominate; well made; some coarse; parallel grooves; (some spindle whorls, no tobacco pipes).

32., 33.

I. Names: 293-23-A and 293-23-C. (A= Gamboudabou?)
Location: Aerial photograph (1970 AO 891-500 (Mali)) 293; 106 mm at 41° from the Principal Point; 13°58'20" N/4°35'45" W; A= 2.3 km at 80° from Weraka, C= 2.4 km at 74° from Weraka.
Landform: Sand Channel; fishing and rice cultivation.
Soil: Loam, sand-loam.
Size: paced, A= N-S = 150 m/E-W = 200 m, 2.36 ha., C= N-S = 75 m/E-W ≐ 140 m., 0.82 ha.; estimated from aerial photograph: A= 1.77 ha., C= 0.88 ha.; height: A= c. 3,0 m, C= c. 4.0 m.
Tree Cover: Light.
Thorn cover: Heavy; very heavy at A.
Confidence in coverage: A= B-C, C= A-B.

II. Surface remains. (Index of complexity: A= 1.0, C= 0.67)

A:	A. 11	J. 2	M. 2
	D. 6	K. 2	O. light
	E. 2	L. 3	BB. 2 statuettes
C:	A. 2	K. 5	M. 1
	J. 2	L. 2	O. light

Comments: Located the site only at the end of the day, after we had long since run out of water; statuettes orineted NNE-SSW, 30 cm from head to head, facing c. 130°, buried within a house foundation in the northeast; recorded 12 June 1977.

III. Preliminary ceramic study

1. Stoker	Balzerini	
2. A= SE (near statuettes)	C= Centre	
3. Light	Moderate	
4. 81	30	
5. Fine and medium	Med. with black	
6. Light Orange	Dark Orange	
7. Tw. 2; also Tw. 4, n=1	Tw. 1	
8. 20%	33%	
9. None	None	
10. Well made	Well made	
11, 13. None	None	
12. None	None	RJM: many Fine with sand

Tentative date of abandonment: A= Phase IV, C= Phase IV.
Tw. 1 and 2 predominate; medium with some fine-sand; well made; (no spindle whorls, no tobacco pipes).

34., 35.

I. Names: 295-10-A and 295-10-B.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 295; 56 mm at 44° from the Principal Point; 13°57'30" N/4°41'40" W; A= 2.3 km at 277° from Koba, B= 3.4 km at 284° from Koba.
Landform: Middle Plain-Sand; pastoralism.
Soil: Light loam.
Size: paced, A= N-S = 54m/E-W = 50 m, 0.21 ha., B= N-S = 25 m/E-W = 50 m, 0.10 ha.; estimated from aerial photograph: A= 0.29 ha., B= 0.20 ha.; height: A= c. 2.0 m, B= c. 0.5 m.
Tree cover: Moderate.
Thorn cover: Moderate.
Confidence in coverage: A= A, B= C.

II. Surface remains. (Index of complexity: A= 0.0, B= 0.0)
Comments: Both sites are blanketed by wind-borne loam and surface scatters are light; recorded 12 June 1977.

III. Preliminary ceramic study

1. SKM	Balzerini	RJM
2. A= NE	A= South	B= North
3. Very light	Light	Very light
4. 40	30	27
5. Med. with grog 60%; Med, with sand, 40%	Med. with grog	Med. with grog, 75%; Med. with sand, 25%
6. LO, 50%; Buff, 40%; blk, 10%	Light Orange	LO, c. 60%
7. Tw. 1, n=11; Tw. 2, n=2; several grooved	Tw. 2	Tw. 1, n=10 Tw. 2, n=1
8. DO, n=3	27%	LO, n=4
9. None	None	None
10. Well made	Well made	Well made
11, 12, 13. None	None	None

Tentative date of abandonment: A= Phase IV, B= Phase IV.
Tw. 1 and 2 predominate; well made; significant sand temper; (no spindle whorls, no tobacco pipes).

36. I. Names: 352-Lin-2.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 352; 122 mm at 48° from the Principal Point; 14°3'40" N/4°29'40" W; c. 1.0 km at 327° from Koina.
Landform: Clay Channel; fishing, rice cultivation, pastoralism.
Soil: Loam to light loam.
Size: paced, N-S = 265 m/E-W = 150 m, 3.12 ha; estimated from aerial photograph: 2.95 ha.; height: c. 1.0 m.

Tree cover: Moderate.
Thorn cover: None.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 1.33)

A. 15	E. 11	L. 2
B. 1	H. 3 (NW)	M. 19
C. 1	J. 26	P. E centre
D. 29	K. 7	V. yes

Comments: Moderate to heavy erosion in the northwestern quadrant; recorded 19 June 1977.

III. Preliminary ceramic study

1.	Clark	Balzerini
2.	East	West
3.	Moderate	Light
4.	34	54
5.	Med. with grog	Med. with grog
6.	LO, 60%; buff, 30%; blk, 10%	
7.	Tw. 4, 40%; Tw. 2, 30%; Tw. 1, 10%; many parallel grooves	Tw. 4
8.	40%	24%
9.	None	None
10.	Moderate	Well made
11, 12.	None	None
13.	1 'couscousière'	None

Tentative date of abandonment: Phase IV (early?)
Tw. 4 and Tw. 1 and 2; (no spindle whorls, no tobacco pipes).

37. I. Names: 352-Lin-3.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 352; 124 mm at 46° from the Principal Point; 14°3'30" N/4°29'30" W; 1.3 km at 352° from Koina.
Landform: Clay Channel; fishing, rice cultivation and pastoralism.
Soil: Loam to light loam.
Size: paced, N-S = 80 m/E-W = 90 m, 0.57 ha.; estimated from aerial photograph: 0.59 ha.; height: 1.0 m.
Tree cover: Moderate.
Thorn Cover: Moderate.
Confidence in coverage: B.

II. Surface remains. (Index of complexity: 0.89)

A. 9	J. 10	O. almost negligible
D. 10	K. 4	V. yes
E. 2	L. 6	

Comments: Much pothunting to the east; recorded 19 June 1977.

III. Preliminary ceramic study

1. Clark	Balzerini
2. NE	SE
3. Moderate	Moderate
4. 42	82
55. Med. with grog	Med. with grog
6. DO, 50%; buff, 30%; LO, 20%	
7. Tw. 2, 30%; Tw. 1, 20%; Tw. 4, 10%; grooves, 10%	Tw. 6, n=7; Tw. 4, n=5
8. DO, 60%	c. 35%
9. White, n=2	Black design, n=1
10. Good	Well made
11, 12, 13. None	None

Tentative date of abandonment: Phase IV (early?)
Predominantly Tw. 1 and Tw. 2, some Tw. 4; some paint; (no spindle whorls, no tobacco pipes).

38. I. Names: 352-Lin-4.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 352; 126 mm at 45° from the Principal Point; 14°3'10" N/4°29'40" W; 1.7 km at 343° from Koina.
Landform: Clay Channel; fishing, rice cultivation, and pastoralism.
Soil: Loam to light loam.
Size: paced, N-S = 125 m/E-W = 185 m, 1.82 ha.; estimated from aerial photograph: 2.06 ha.; height: c. 2.0 m.
Tree cover: Moderate-heavy.
Thorn cover: Light.
Confidence in coverage: A.

II. Surface remains. (Index of complexity: 1.44)

A. 20	K. 4	O. yes
D. 12	L. 14	P. E, Centre, SW
E. 2	M. 1	BB. fragment
F. yes		GG. 2
G. 2 (plain)		HH. calcareous nodules, SE

Comments: 19 June 1977.

III. Preliminary ceramic study

1. Clark	Balzerini
2. W. centre	SE
3. Moderate	Light
4. 36	45
5. Med. with grog Coarse, 5-10%	Med. with grog.
6. Grey, 40%; LO, 30%; buff, 30%	
7. Tw. 1, 50%; grooves, 5% Tw. 4, n=2	(Tw. 6)

8.	DO, 50%	n=17
9.	White, 10%	None
10.	Moderate	Well made
11.	Thick wall, Tw. 2 in grid, n=1	None
12, 13.	None	None

Tentative date of abandonment: Phase IV.
Tw. 1 predominates, with some Tw. 4 and Tw. 6; some coarse-grog fabric; some paint; (no spindle whorls, no tobacco pipes).

39. I. Names: 379-Lin-5.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 379; 51 mm at 160° from the Principaal Point; 14°4'30" N/4°29'30" W; 3.0 km at 360° from Koina.
Landform: Clay Channel; fishing, rice cultivation, and pastoralism.
Soil: Light loam.
Size: paced, N-S = 130 m/E-W = 125 m, 1.28 ha.; estimated from aerial photograph: 1.57 ha.; height: c. 2.0 m.
Tree Cover: Light.
Thorn cover: Heavy.
Confidence in coverate: B-C.

II. Surface remains. (Index of complexity: 1.22)

A. 4	J. 2	O. yes
D. 5	K. 6	U. copper nodule
E. 3	L. 14	DD. glass bead
	M. 6	GG. one, large

Comment: Pothunting to the southeast and northwest; margins of the site very badly obscured by thorns; recorded 19 June 1977.

III. Preliminary ceramic study

1.	Clark	Balzerini
2.	SW	SE
3.	Light	Light
4.	18	37
5.	Med. with grog	Med. with grog
6.	LO, 80%; buff, 10%; blk, 10%	
7.	Tw. 1, 30%; Tw. 2, n=2; grooves w. incise, n=1	Tw. 2
8.	DO, n=3	n=13
9.	None	None
10.	Moderate	Moderate-well made
11.	Combination of incised and grooved, n=2 or 3	None
12, 13.	None	None

Tentative date of abandonment: Phase IV.
Tw. 1 and Tw. 2 predominate; moderately well made; (no spindle whorls, no tobacco pipes).

40. I. Names: 379-Lin-6.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 379; 48 mm at 2° from the Principal Point; 14°7'5" N/4°29'50" W; 1.5 km at 337° from Lanaoue.
Landform: Sand Channel; fishing, rice cultivation, and pastoralism.
Soil: Sand-Light loam.
Size: paced, N-S = 150 m/E-W = 145 m, 1.71 ha.; estimated from aerial photograph: 1.72 ha.; height: c. 3.0 m.
Tree cover: Light.
Thorn cover: Heavy.
Confidence in coverage: B-C.

II. Surface remains: (Index of complexity: 1.33)

A. 5	J. 6	O. yes
C. 1	K. 4	P. SE centre, SE
E. 2	L. 2	V. 10
G. 1	M. 8	W. 2

Comments: Recorded 19 June 1977.

III. Preliminary ceramic study

1. Balzerini	Clark
2. Centre	SE
3. Heavy	Moderate-heavy
4. 108	46
5. Med. with grog	Med. with grog
6.	Buff, 50%; LO, 45%; DO, 5%
7. Tw. 2	Tw. 1, 40%; Tw. 2, 10%; grooves, 45%; Tw. 4, n=1; Tw. 6, n=2
8. n=35	70% (most DO)
9. None	White, 10%
10. Well made	Moderate
11, 12. None	None
13. Many net weights	1 'couscousière'

Tentative date of abandonment: Phase IV-V.
Tw. 1 and Tw. 2 predominate, some Tw. 4 and 6; parallel grooves; (2 spindle whorls, no tobacco pipes).

41. I. Names: 379-Lin-7.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 379; 62 mm at 34° from the Principal Point; 14°7'30" N/4°31'25" W; 2.5 km at 324° from Lanacue.
Landform: Sand Channel; fishing, rice cultivation and pastoralism.
Soil: Light loam.
Size: paced, N-S = 375 m/E-W = 175 m, 5.15 ha.; estimated from aerial photograph, 4.81 ha.; height: c. 1.0-2.0 m.

Tree cover: Very light.
Thorn cover: Heavy at the margins.
Confidence in coverage: A-B.

II. Surface remains. (Index of complexity: 2.44).

A. 31	F. several	L. 33	Q. several
B. 1	G. c. 24	M. 31	R. many
C. 2	I. yes	N. a few, SW	S. yes
D. 45	J. 43	O. heavy	V. 4 FF. many
E. 32	K. 62	P. SE centre, S cent, N cent, SW centre.	W. 1 X. 8

Comments: To the W centre erosion has exposed a large complex of urns (all types); rich site ; recorded 19 June 1977.

III. Preliminary ceramic study.

1. Balzerini	Clark	Clark
2. SE	SE	NW
3. Heavy	Moderate-heavy	Moderate-heavy
4. 127	55	34
5. Med. with grog	Med. with grog	Med. with grog
6.	Buff, 30%; LO, 30%; LO/blk, 20%; grey, 20%	LO, 30%; blk, 20%; LO/blk, 20%; buff, 10%
7. Tw. 4	Tw. 1, 20%; Tw. 2, 20%; Tw. 4, 20%	Tw. 1, 30%; Tw. 2, 30%; Tw. 4, 10%
8. n=41	DO, 50%	DO, 25%; CO, m=2
9. None	White, 15%; Yellow, n=1	None
10. Well made	Moderate	Moderate
11. None	2, parallel grooves with incised and circles	Carinated with parallel grooves and circles
12, 13. None	None	None

Tentative date of abandonment: Phase IV-V.
Tw. 1 and 2 predominate with some Tw. 4, some parallel grooves; (1 spindle whorl, no tobacco pipes).

42. I. Names: Jenne-Jeno.
Location: Aerial photograph (1970 AO 891-500 (Mali)) 159; 13°53'20" N/4°32'25" W; 2.5 km at 132° from the Jenne mosque (CM 1).

II. Surface remains. (Index of complexity: 2.56).

A. 40	I. yes	O. yes	U. yes	AA. yes
C. 17	J. 23	P. SE, NE	V. yes	BB. yes
D. 52	K. 73	Q. yes	W. yes	DD. yes
E. 72	L. 4	R. yes	X. yes	EE. yes
F. yes	M. 1	S. yes	Y. yes	HH. calcareous nodules
H. 1	N. 2	T. yes		

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